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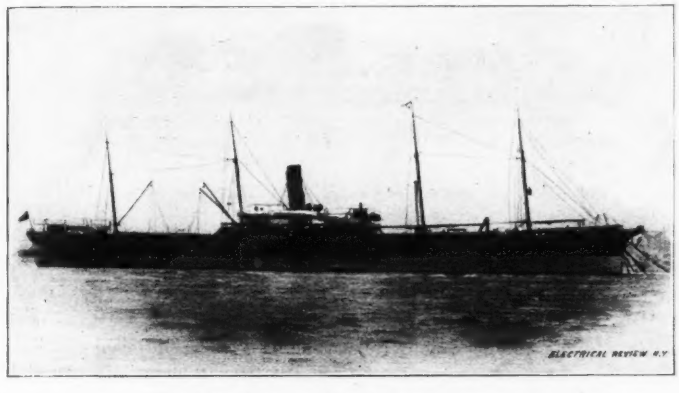
VIEWS, NEWS AND INTERVIEWS.

"Although we had mighty little to work with," said a second lieutenant in the engineer corps of the regular army, "I think it is beyond question that the army in the Santiago campaign was well and promptly equipped with telephone and telegraph service. A large part of our equipment was left behind in the transports, through no fault of ours, when the landing of the troops was made. So we had to get along with what material we had and what we could improvise from material at hand. There are quite a number of telephone and telegraph lines around Santiago, and all of them had been cut and destroyed by the Spaniards. The telegraph lines we repaired with barbed wire fencing cut out on the spot. Fortunately, we had a lot of insulated wire, with which we strung a telephone line. This was run through trees, a turn of the wire being taken around the most convenient limb. No insulators were used, and the wire often sagged and lay on the ground. But she worked all right. I was at a station in the hills back of El Caney on July 3, when Cervera's fleet went out of Santiago Harbor. We heard the guns and telephoned for information. Within half an hour we had all the facts, and you can gamble we made a noise ourselves."

Mrs. G. P. Blow, of La Salle, Ill., has requested the Central Electric Company, of Chicago, to issue to her duplicate certificates for 25 shares of stock in that company, the originals of which were in the possession of her husband, who was on the "Maine" when it was blown up in Havana Harbor on February 15, 1898. It is supposed that the original certificates were lost in the "Maine" disaster.

The electric light and incandescent gas light, utilizing a mantle, have had many a hard fight in competition. Of course, it is hardly necessary to say that the mantle can never compare with the electric light in beauty, but it is most interesting to know that two electric men have embarked in the incandescent gas business and have administered some pretty hard shocks to the mantle people, and bid fair, it is claimed, to overturn the whole mantle system of incandescent gas lighting. The work of Dr. J. B. De Lery, who developed the Wenstrom electric system in this country, and F. Z. Maguire, formerly Mr. Edison's representative in Europe, the former as the inventor and the latter as the exploiter of a novel gas burner and system of utilizing incandescent material, has attracted wide attention with gas people, and the new lights are rapidly displacing the old form of mantle burners. We have always felt that gas people would have to acknowledge the superiority of electricity, and this seems to be a forerunner of what, perhaps, may be administered in even more forcible shape later on. It is altogether too good a joke, however, on the gas people, to keep.



THE NEW BRITISH CABLE SHIP "ANGLIA."

Editor Godkin, of the New York *Evening Post*, is famous for his illegible handwriting. Some years ago he wrote out a telegram and sent it to a Western Union office. It was returned to Mr. Godkin as undecipherable. He rewrote the message, and it was again returned to him for the same reason. Then he took a ruler and, after an hour's labor, succeeded in printing the telegram in large capitals so that it could be read.

A report of Commodore Philip to the Navy Department indicates that Lieut. Cyrus S. Radford, of the "Texas," was an officer who rendered valuable and conspicuous service, both afloat and ashore, in the Spanish war. Lieutenant Radford was at Camp McCalla in the two days' fighting at Guantanamo, and had charge of the funeral escort which was fired on by the Spaniards, his men remaining at parade rest, notwithstanding the Mauser bullets. On that memorable July 3 he had charge of the guns in the fighting tops and forward and after superstructure of the "Texas." Commodore Philip speaks in the highest terms of his good work, not only in the battle, but lays stress on the fact that his entire division volunteered for duty in the fire-room during the chase for the "Cristobal Colon." Lieutenant Radford is one of the best known young officers in the service, and is the author of Radford's "Handbook on Naval Gunnery," which is now in its fourth edition, published by the D. Van Nostrand Company, of New York city. He is a graduate of the class of '90 United States Naval Academy, and was appointed from Kentucky.

The Falmouth Chamber of Commerce, according to a London contemporary, has resolved to draw the attention of the Board of Trade to the danger of allowing electric light to be used as a masthead light. The matter had been prominently brought forward in connection with the wreck of the "Mohegan," as it is declared that, owing to the electric light being extinguished, the lifeboats were unable to find the wreck.

The New British Cable Ship "Anglia."

The trial trip of the Telegraph Construction and Maintenance Company's new twin-screw cable ship "Anglia" recently took place between Barrow and Liverpool Northwest Lightship. The distance on the two journeys, going and returning, was 60 knots, resulting in an average speed of 13.5 knots per hour.

The principal dimensions of the ship, which was built by Vickers Sons & Maxim, of Barrow, are as follows: Length, 467 feet over all; breadth, moulded, 54 feet; depth, moulded from top of keel to spar deck, 36 feet. She has a double bottom, four feet three inches high, and water ballast capacity of 1,400 tons. Fully loaded to Suez Canal draught she can carry 8,620 tons dead weight. There are four pole steel masts fitted with derricks.

The anchor gear is of the most modern kind, and the anchors of the stockless pattern. The steam steering engine is carried on the tiller, thus doing away with all chains, and is controlled by a telemotor from the bridge. The electric lighting of the ship is in duplicate, the dynamos are coupled direct to the engines, and the light leads are protected in steel insulated tubes.

Amidships, under the bridge deck, is the dining saloon, and sleeping rooms for the staff and officers of the ship, together with kitchen, pantry, bath rooms and other offices. The spar deck, bridge deck and navigating bridge are laid with East India teak planking. The main engines are two sets of the triple-expansion inverted direct-acting type, having cylinders 22, 35½ and 61 inches diameter, respectively, with a stroke of 48 inches.

There are four single-ended steel boilers 16 feet 4 inches diameter, 10 feet 10 inches long, with four furnaces each. The working pressure is 195 pounds per square inch. The indicated horse-power on the trial trip was 4,000. The propellers are four-bladed, of bronze.

After the trial trip, which was most satisfactory in every respect, the

"Anglia" was handed over to the command of Capt. W. R. Cato, who then brought her round to the Thames. She is now moored off the company's works at Greenwich, to be fitted with four cable tanks, her paying out and picking up machinery, etc. The machinery is to be of the latest construction and design.

The tanks and machinery have been built at Greenwich by the Telegraph Construction Company, and include many improvements dictated by the experience of the company's engineer and staff.

Her first voyage will be laying a cable for the Eastern Telegraph Company, from Gibraltar to Malta and Alexandria, on which she will shortly be dispatched, with a total length of 2,181 miles, weighing some 4,650 tons. We are indebted to the London *Electrical Review* for the accompanying illustration and the above particulars.

ELECTRIC RAILWAY NOTES.

Charles Forhmann, of Jersey City, whose suit for $10,000 against the Consolidated Traction Company, for injuries received by being ejected from one of the company's cars, was recently tried, has been awarded a verdict of $5,000.

At the meeting of the stockholders of the Enfield & Longmeadow, Ct., Electric Road, officers as follows were elected: President, George Graham, of New Haven; vice-president, George T. Mathewson; treasurer and general manager, L. A. Upson.

The report of the Metropolitan Street Railway Company, of New York city, for the quarter ended September 30 last, shows: Gross earnings, $2,907,562; operating expenses, $1,466,640; net from operation, $1,440,921; other income, $181,736; fixed charges, $1,070,848; net income, $551,809; profit and loss (surplus), $1,775.772; cash on hand, $5,493,323. The net income for the corresponding quarter last year was $384,186.

At the annual meeting of the Palmer, Mass., & Monson Street Railway Company, the following officers were elected: Directors, C. F. Grosvenor, Andrew Pinney, E. G. Hastings, H. P. Holden, Rufus Flynt, G. C. Flynt, E. G. Childs, G. H. Wilkins and H. E. W. Clark. The directors elected these officers: President, C. F. Grosvenor; vice-president, E. G. Hastings; treasurer, C. E. Fish; clerk, Andrew Pinney. It was shown that the road had been running four months at a profit, the gross receipts being $8,000.

Comparative Costs and Profits of Cable, Electric and Horse Railway Operation in New York City.

Through the kindness of President H. H. Vreeland, of the Metropolitan Street Railway Company, of New York city, the *Street Railway Journal* presents in its November issue a table prepared by him showing in detail the relative costs and profits of cable, electric and horse railway operation by the Metropolitan Street Railway Company, of New York, for the year ended on June 30, 1898, and for the quarter ended on September 30, 1898. With the table is also printed an article giving an exhaustive analysis of its figures. The most important deduction made in this article is that the Metropolitan company's experience "points unmistakably to the great superiority of electricity over both horse and cable, not only in traffic-handling capacity, but in economy." On January 1, 1893, the entire street railway system of New York city was operated by horses. In the Spring of that year the first cable line, that in Broadway, was put in operation. Cable construction stopped in 1895, when electric construction began.

During the 12 months ended on June 30 the company operated 34.2 per cent of its car mileage by the cable system, 20.2 per cent by the electric system and 45.6 per cent by horses. During the last quarter, however, ended on September 30, the proportions were greatly changed, the cable mileage being only 27.4 per cent of the total, the horse 33.7 per cent, while the electric had risen to 39.1 per cent. For the year the operating expenses of the cable lines were 16.42 cents per car mile, of the horse lines 17.87 cents, and of the electric lines 10.23 cents. For the three months' period, which is more favorable to electric operation, the cable lines cost 17.55 cents, the horse 17.89 cents and the electric 10.06 cents.

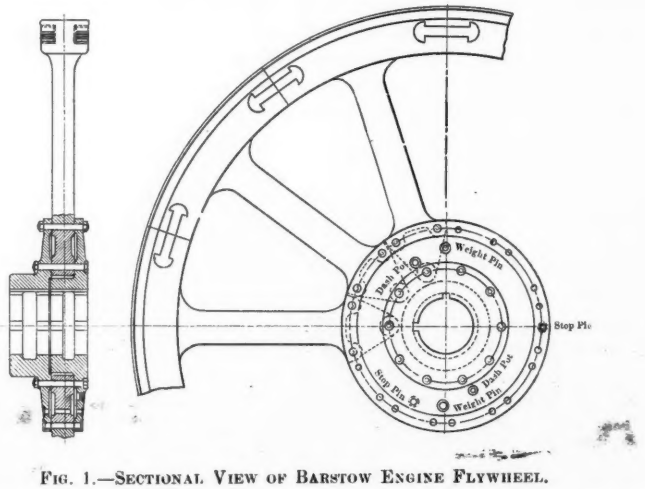


FIG. 1.—SECTIONAL VIEW OF BARSTOW ENGINE FLYWHEEL.

"From a careful study of the figures," says the *Journal*, "we believe that, were all the lines in New York city to be equipped with a single motive power, electricity would have a permanent advantage over the cable of at least 3.5 cents per car mile in maintenance of way, a slight disadvantage in maintenance of equipment, and an advantage of at least 1.25 cents in power, of 1.5 cents in transportation, and of 0.5 cent in general expenses, a total of nearly 6.75 cents per car mile. In comparison with horse traction, electricity would be at a disadvantage of perhaps 0.5 cent per car mile in maintenance of way and 0.5 cent in maintenance of equipment, while it would have an advantage of at least six cents in motive power, 1.5 cents in transportation and five cents in general expenses—a net difference of seven cents. Besides this, electric cars would earn more than either horse or cable cars with equivalent mileage."

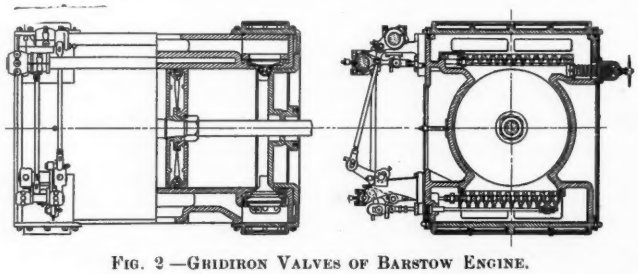


FIG. 2.—GRIDIRON VALVES OF BARSTOW ENGINE.

In the quarterly statement, it will be seen that, in every grand division of operating expenses, electricity has a decided advantage over the cable system, and in every division except maintenance of equipment it has an advantage over the horse system. During the 12 months period the cable lines operated at 47.7 per cent of their passenger receipts, the electric lines at 37.9 per cent, the horse lines at 65.3 per cent, and the entire system at 53.3 per cent. During the three months' period the cable lines operated at 52.7 per cent of their passenger receipts, the electric lines at 38.6 per cent, the horse lines at 62.1 per cent, and the entire system at 50.9 per cent."

In conclusion, it is pointed out that the installation of an electrical traction system would not be feasible everywhere. Conditions favorable to it here are the cleanliness of the city, the moderate rainfall and snowfall, and the heavy traffic density, enabling the company to afford the enormous initial cost of the conduit system, which averages from $50,000 to $100,000 per mile of single track.

The Telegraph in the Philippines.

A correspondent of the *Telegraph Age* writes from the Philippines as follows:

"There are about 15 telegraph offices on this island. Bacoor is Aguinaldo's headquarters, and is located about midway between Manila and Cavite. There are six operators there, and they are the only Americans within a radius of 15 miles. No American troops are stationed along the country roads leading to this town. Aguinaldo's men guard the road, and the place gets rather lonesome at times, although the insurgents are very friendly to us. There are quite a number of Spanish prisoners around their quarters, and they are all pretty badly off, as the insurgents will not feed them, and our supplies for six men will not go far toward appeasing their appetites. We, however, contribute our mite whenever we can.

"The first Signal Corps, which is made up of Minnesota operators, is to go to Honolulu, and the remainder of the boys is to be left here. We have no idea when we will return, nor do we receive any important news.

"There is no sickness among the telegraphers, who are apparently all satisfied with their positions. Of course, it goes without saying, we love the United States more than ever before, and we do not imagine any one of us would raise a rumpus if ordered to return."

The Barstow Engine at the Brooklyn Edison Company's Union Station.

This engine is installed in the Brooklyn Edison Electric Illuminating Company's new Union station at Sixty-sixth street, Bay Ridge. It is of the tandem twin-compound-horizontal-side-crank type, direct connected to a 2,000-kilowatt generator of revolving-field type Each side of the engine is independent of the other, and connected to independent condensing apparatus, surface condensers and electrically driven air-pumps being used. The rated power of the engine is 3,200 indicated horse-power, and it is capable of taking

The prominent features of this engine, which was built by McIntosh, Seymour & Company, of Auburn, N. Y. are gridiron valves on all cylinders sliding crosswise of the cylinder on gridiron seats, which are separate and removable from the cylinder itself. (See Fig. 2.) They move intermittently, remaining almost motionless when closed and subject to steam pressure, hence require but little power to operate They wipe over and hence wear evenly, remain tight when old, a requirement absolutely necessary to sustained economy. The high-press ure cylinder is jacketed and a receiver placed between high and low pressure cylinders.

the wearing down of the cylinders by the pistons.

The main valves are driven by an eccentric controlling the admission of steam and the opening and closing of exhaust. The cutting off of the steam is effected by the cut-off valves which are controlled by the governor.

The cut-off takes place when the main valve and cut-off valves are moving in opposite directions, and can occur at any point between zero and maximum cut-off. The cut-off is varied simultaneously on all the cylinders in such a manner that the amount of work done in each is approximately the same. The gov-

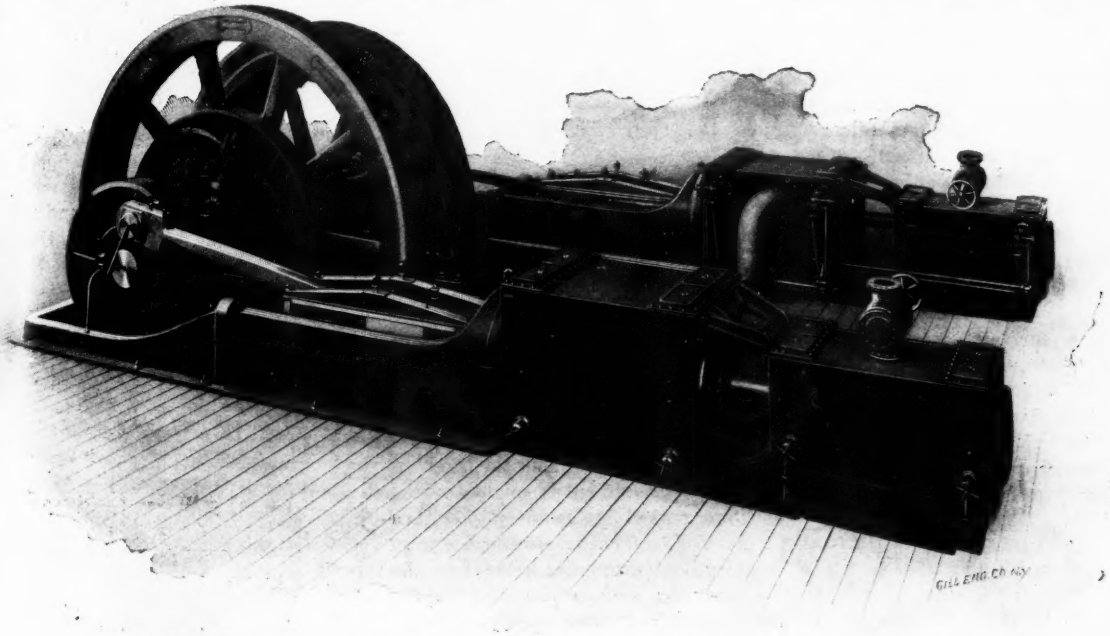


FIG. 3.—3,200 HORSE-POWER DOUBLE-TANDEM GRIDIRON-VALVE ENGINE IN THE BROOKLYN EDISON COMPANY'S NEW UNION STATION.

care of overloads of 50 per cent. The cylinders sizes are: High-pressure cylinder, 24 inches diameter, 66 inches stroke; low-pressure cylinder, 48 inches diameter, 66 inches stroke. It is designed to run under 165 to 200 pounds pressure; speed, 75 revolutions per minute. The engine was designed and built upon specifications which called for less than one-quarter of one per cent variation in angular velocity; the above regulation being deemed necessary when the generator is operated in connection with rotary transformers, etc. The flywheel is 24 feet in diameter, weighs 150,000 pounds, and is built up in 10 sections, each segment of the rim being cast in one piece, with its arm. (See Fig. 1.) The segments of the rim are joined by steel arrow-head links, and the arms held by reamed bolts between the hub plates, which are forced on the shaft by a hydraulic press of 500 tons capacity.

In the receiver are placed brass heating coils containing steam at boiler pressure. They superheat the steam entering the low-pressure cylinder to a considerable degree. The connection between cylinders is such that the low-pressure cylinder can be removed without disturbing the high pressure cylinder, affording ready access to the low-pressure cylinder. Between the cylinders the piston rod runs in a packing sleeve or tube provided with packing blocks, which take up the wear of the rod and prevent leakage. This sleeve obviates the necessity for stuffing boxes between the cylinders and adds greatly to the running qualities of the engine, for the large bearing surface of the piston rod on the long babbitted packing sleeve, together with bearing surface at the cross head, 722 square inches, guides and steadies the piston rod supporting the pistons in the cylinders, and prevents trouble from

ernor controls the cut-off eccentric by revolving it on the shaft.

The crossheads have a bearing surface each of 19 inches by 38 inches, and are made of open hearth steel in one piece with the cross-head pin, which is 11½ inches in diameter and 11 inches in length. The slides are babbitted and run in depressed ways, being in a measure self-oiling, and are guided laterally by their internal edges, so that should the cross-head warm up it will run more freely instead of having a tendency to bind as with frequent construction. The crank disks are arranged with counterbalance and are forced on the shaft by hydraulic pressure. The crank pins are securely keyed, are 13 inches in diameter, 11 inches in length and are forced into the disk by hydraulic pressure. The main bearings are 24 inches in diameter, 42 inches in length, and are fitted with cylindrical shells, which can be easily removed by jacking up the shaft sufficiently to take weight off the bearing, when they may be revolved around the shaft and taken out without disturbing any other parts of the engine. These shells are made hollow for water circulation, and should the bearings become hot from any unusual cause they can be cooled by this means, enabling the engine to complete its run without any interruption.

The oiling devices are arranged to insure complete and continuous lubrication of every moving part. The main bearings are equipped with separate oiling systems, which keep them continuously flooded with and prevent a waste of oil. At the ends of the bearings are rings which throw the escaping oil into shields, whence it is drained into reservoirs beneath the engine. A small pump, driven by the valve gear, forces the oil from the reservoir into supply tanks placed above the bearings. These tanks are of large capacity, and arranged so that they can be used as ordinary oil cups in case the automatic supply is cut off while the engine is running. Separate and distinct from the above system is the general oiling system. The cross-head, piston-rod, connecting-rod boxes and eccentrics are each provided with sight feed, continuous-oiling apparatus. The crank pins have centrifugal oilers and the eccentrics telescope oilers. These telescope oilers insure continuous oiling, and are provided with suitable shields which prevent any oil from this source working into the armature or wheel, a thing not easily prevented with the usual method of oiling eccentrics. Waste oil from the guides, cross-head pins, crank pins and piston-rods is drained into the crank pits, from which it is piped to the receiving reservoir. The pins and bearings in the valve gear are fitted throughout with devices for grease lubrication, which require attention and refilling only at long intervals, and secure excellent lubrication together with cleanliness.

A Santiago Telephone Directory.

Gen. C. H. Barney, of the New York Telephone Company, is in possession of a telephone directory brought from Santiago by a telephone man, a member of the Seventy first Regiment. He found it hanging by the side of a telephone that was not in use, and brought it here as an interesting relic. It shows that there are some 90 subscribers to the telephone exchange at Santiago, who paid the neat little sum of $25 a month for the service. The directory is printed, of course, in Spanish, and the announcement is made that the apparatus is manufactured by the Western Electric Company—"Americano." Considering the price of the service, the telephone people of this country will, no doubt, see abundant excuse for the insurgents to rebel.

INDUSTRIAL NEWS OF THE WEST.

"Eastern electrical manufacturers will do well to keep their salesmen in the middle West for the next three months," said the head of a great electrical supply house—a man whose business sagacity and keen intellect is appreciated by all who come in contact with him. I have heard it said by all classes of people interested in the electrical industry here, at Cleveland, St. Louis, Pittsburgh, Cincinnati and the smaller centers, "our interests

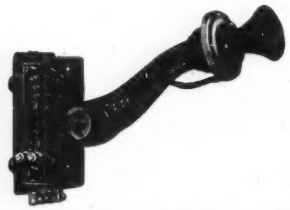


FIG. 1.—VICTOR LONG-DISTANCE ARM TRANSMITTER.

are better than they have been, our factories are busy and we are not in need of orders." These remarks are not mere isolated cases, but to one who makes a systematic inquiry throughout the western industrial fields they will be found so general as to prove a true reflection of the business conditions of the electrical trades.

The construction of lighting plants, particularly isolated plants, is unusually active, as also is the growth of telephone lines for local exchanges, factories and private lines.

It is interesting to note how this demand has brought into action an unusual aggregation of capital and brains for the production of telephone apparatus in the middle West within the past two years. The "independent" telephone industry has certainly experienced a healthy growth, for today there are in the city of Chicago alone six or seven large and well equipped factories, with plenty of financial indorsement, now producing great quantities of a very high grade of telephone instruments, excellently constructed switchboards, and which are continually developing various devices for telephone applications. The striking thing about the telephone situation seems to be that with the advent of these many new makers of telephones the demand seems to have well kept pace with the production and it may be taken for a fact that the telephone manufacturing field still offers good possibilities for investment provided competent designers of apparatus are employed.

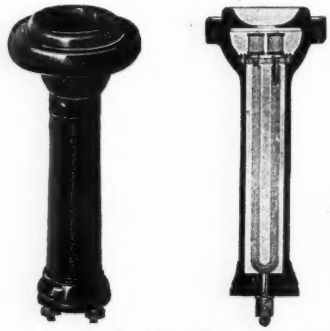
Next to Chicago, St. Louis is fast becoming a promising electrical center. If not a manufacturing center, at least a center of supply. This has been brought about because St. Louis is several hours further West than Chicago, and people who buy electrical goods must have quick shipments.

I am told that the Western Electric Company's factory is running on full time with an entire complement of workers in every department; in fact, in some of the shops night shifts are employed and operators are busy 24 hours daily. The Western Electric Company have recently accepted arrangement with the Stanley Electric Manufacturing Company, of Pittsfield, Mass., for the care of the sales in the Western territory of the "S. K. C." system of power transmission machinery.

A new factory has recently been equipped for producing the "Wright" demand meter in Chicago. The meter has been in development for several years and it is now said that the makers are disposing of nearly 1,000 meters monthly—all they can produce.

One of the western roads—the Atchison, Topeka & Santa Fé—running through trains between Chicago and the Pacific coast, has just equipped several trains with electric lights, using current generated from the axles.

In looking at a number of electric light and power plants in the West, one is impressed by the fact that the dynamos and motors are of Westinghouse, General Electric and Crocker-



FIGS. 2 AND 3.—THE VICTOR DOUBLE-POLE RECEIVER.

Wheeler makes, or from some other of the eastern factories. A discussion of the subject elicited the information, which at once becomes evident, that west of Cleveland very little machinery of this character is made. The business in the West is largely controlled by local branches of these manufacturers. Since then I have heard it whispered that a number of gentlemen of capital are considering organizing a company to be located at or near Chicago and make a line of electrical machinery, to embody most modern design and principles of construction, with the aim of controlling this branch of the electrical business in the West.

STEPHEN H. GODDARD.

Chicago, November 2.

Victor Telephone Apparatus.

The illustrations presented herewith show several types of telephone apparatus and accessories made by the Victor Telephone Manufacturing Company, of Chicago. This company has recently extended its already very complete line of telephone apparatus, and is now presenting to the telephone field a wide range of apparatus from which devices for any kind of service desired may be readily selected. In Fig. 1 is shown the

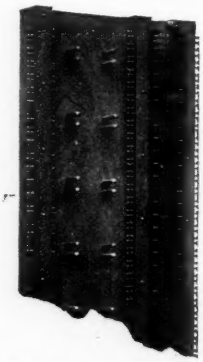


FIG. 4.—VICTOR CROSS-CONNECTING AND FUSE BOARD.

Victor long-distance arm transmitter. The carbon disk in this transmitter is held in a hard-rubber cup, and is corrugated so as to aid in sustaining the globules evenly distributed within the retaining fiber. The accumulation of moisture and the packing caused by excessive weight in the lower part of the receptacle are thus avoided. The transmitter is also furnished with a flat back where the induction coil is placed with the magneto or in some other place.

Figs. 2 and 3 illustrate the Victor double pole receiver. This is made in three types, the regular large size shell, the pony type, and the bell flare. Fig. 3 is a cross section of the large size receiver, showing the fine construction of parts. The magnets are made of the best Tungsten steel and are secureiy fastened at the lower end of the shell, the ends being milled so as to receive the projecting ends of the coil magnets, which are fastened to a plate resting on a flange in the head of the receiver. This construction avoids the variation caused by contraction or expansion, making the adjustment permanent. The same system of construction is applied to all the types of receiver made by the Victor company.

The Victor cross-connecting and fuse board is illustrated in Fig. 4. It is a complete and inexpensive device mounted on a strip nine inches wide. The line connection is made on one side, passing through the fuse link, under which is the ground strip, to the second connecting point, from which it is carried to any desired point connecting with the switchboard cables. The ease with which common return, ground, or metallic circuits may be converted, makes it a valuable device for exchanges using the different systems.

In Fig. 5 is shown the Victor non-disconnecting lightning arrester, a simple device most effective in its application. There are three carbon disks in parallel, separated at each end by narrow strips of mica and held in position by brass terminals, to which binding posts are attached. The center carbon is grounded and each side forms a connecting link for a metallic circuit. This permits the circuit to remain closed at all times, and, owing to the slight space beneath the center or grounded carbon, any high potential or foreign current is readily conveyed to the ground. For use on grounded circuits, the main line is connected to the center carbon and both side carbons are grounded, thus relieving the line of induction commonly encountered on grounded circuits.

New York Edison Company.

An officer of the Edison Electric Illuminating Company of New York is quoted as saying: "We are not prepared to state whether we will

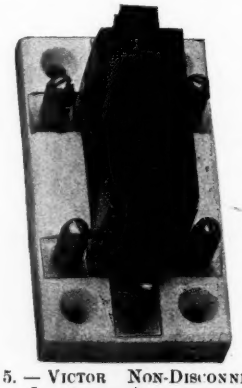


FIG. 5.—VICTOR NON-DISCONNECTING LIGHTNING ARRESTER.

meet the cuts recently made by our competitors or not. As has been repeatedly stated in circulars and reports issued, we intend to reduce the cost to our subscribers to the long-time service as fast as the situation warrants. The reductions made a year ago have been followed by largely increased gross and net returns, as shown in the report of our earnings for the first nine months of the current year. The still further reductions suggested in our October circular as possible on January 1 may take place before or after that date, dependent upon the result of our October reductions."

Electric Railway Expansion in Washington, D. C.

Some months ago the Eckington & Soldiers' Home Railway Company (horse-car line) passed into the control of a syndicate, represented by O. T. Crosby and associates. During last session of Congress a bill authorizing the company to equip the road with an underground electric system was passed. The work will be begun soon and it is expected the road will have been remodeled by Spring-time.

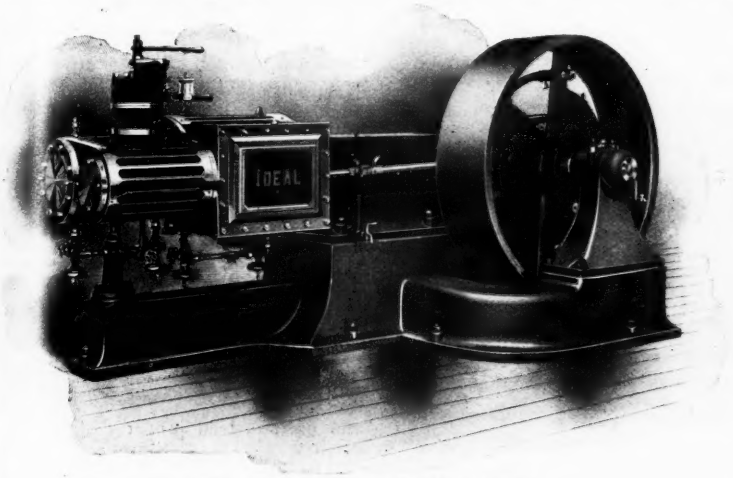


Fig. 1.—A Modified "Ideal" Engine.

In the meantime, the capitalists controlling this line and its associated lines have been quietly buying control of other lines. It is rumored that they have just obtained control of the Anacosta Railroad, another horse-car line, and of the Tenleytown road, an overhead electric line. They are also in control of the Washington & Maryland Railroad and the Bell line, making a total road mileage of 25 miles—double tracks being measured as single. The other companies have mileages as follows: Capital Traction, 16 miles; Metropolitan, 12 miles.

The City & Suburban, the name of the new consolidated company, expect in time to continue the line of the Washington & Maryland to Laurel, Md., and in the future to Baltimore.

Mr. O. T. Crosby, on being asked to confirm the rumors of purchase, would not deny them. He was not ready to give out information for publication.

There is another rumor of the Potomac Electric Power Company, Mr. Crosby's company, getting control of the United States Electric Light Company, thus putting under one management all the electric light companies in Washington.

The Chicago-Milwaukee Road.

Vice-president Frost, of the Chicago & Milwaukee Electric Railway, in a recent conversation, said: "Our road will run between Waukegan, Ill., and Chicago. It is in operation between Waukegan and Highland Park, about 16 miles. We do not expect to have the road completed to Evanston until early next Summer. We shall then have 30 miles of road connecting 15 cities and towns having a population of 70,000 people. Our road has not a single steam or electric railroad crossing the entire line. Of the $1,000,000 bonds authorized, $400,000 are delivered by the trustee upon the company's power plant and 16 miles of road built and in operation, the balance to be delivered at the rate of 75 per cent of actual cost of betterments and extensions. The cost of the road between Waukegan and Highland Park and franchises which we purchased from the Bluff City Electric Street Railway Company is about $510,000. The gross earnings for three months ending October 1 amounted to $12,025; operating expenses, $7,672; net profits, $4,353."

Don't Swear—Work!

When the Spanish fire on San Juan hill became almost unbearable, some of the Rough Riders began to swear. Colonel Wood, with the wisdom of a good leader, called out amid the whistle of the Mauser bullets, "Don't swear—fight!" The advice is good for other places than the battlefield. Translated into the language of everyday business life, Colonel Wood's order means "Don't worry—work!" Don't waste your energy in swearing, but take the time to shoot straight. Don't waste your strength in worrying and fretting, but save it all for work—intelligent, thoughtful, unremitting work. That is the policy that wins victories in trade, as well as on battlefields.—*Printers' Ink.*

Rushmore's Three-Wire Dynamo.

Up to a few years ago the three-wire system was employed in all large isolated plants and small low-tension stations by reason of the large saving in copper over the two-wire system. It was found, however, that where the all-day load was less than the capacity of two of the standard units employed, the losses in operating the small or lightly loaded machines more than offset the saving in copper at full load, and therefore in most plants recently installed the simple two-wire system is used, and many small stations are now using the two-wire system with 250-volt lamps, although the higher price of such lamps and their lower efficiency largely offsets the saving in copper.

There has lately been placed on the market a machine that, it is claimed, will supply a three-wire system and maintain the voltage with any distribution of load. The machine is of the usual multipolar construction, with single armature winding, single commutator, etc. It differs from ordinary machines only in the manner of exciting the fields, which is a modification of the multi-circuit system perfected by Mr. Rushmore in his multi-voltage dynamos, motor dynamos and multi-circuit arc machine.

There is now running at the Rushmore works a 30-kilowatt machine supplying a three-wire system that is said to fulfill all the conditions of two 110-volt machines in series. It will deliver its entire output at 220 volts or at 110 volts, and one side may be loaded to 75 per cent of the total kilowatt capacity of the machine without loss in efficiency and without interference with the other side, which may or may not be loaded. The brushes are fixed and there is no sparking with any distribution of load. One side of the system may be kept constant at any voltage and the other raised or lowered to any extent without the least interference. It is believed that this type machine will come into extensive use in large as well as small plants, as with it the three-wire system may be employed with all its saving in copper and without the losses of running two small or lightly loaded machines at periods of light load.

A Modified "Ideal" Engine.

Illustrated herewith is a special type of "Ideal" engine for purchasers who prefer to transmit the power from one pulley supported between two bearings. It is a modification of the Ideal tandem compound engine, standard pattern, especially adapted for factory or mill, and all purposes where high efficiency with simplicity and reliability is desired. The space occupied per delivered horse-power is small, and the cost of foundations and installations is moderate.

Another pulley can be placed between the bearings, by making a longer extension of the sub-base; or by extending the shaft through the bearing, the extra pulley can be placed outside.

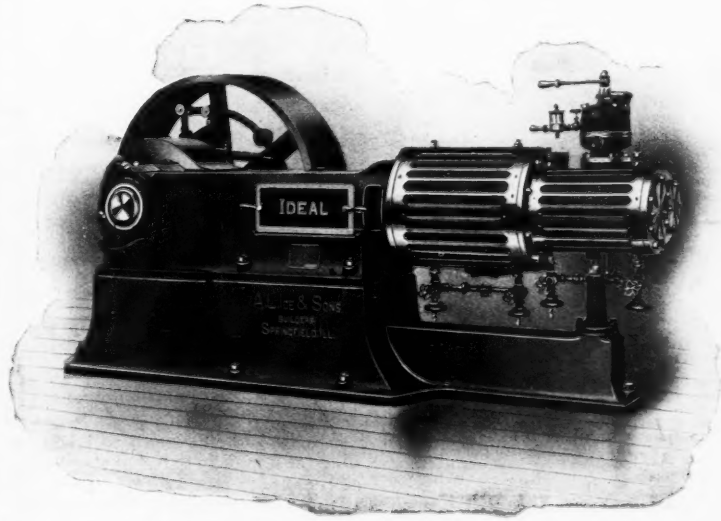


Fig. 2.—Another View of a Modified "Ideal" Engine.

This style is also made with an extension of the sub-base, to receive direct-connected electric generators on the same shaft, between the governor pulley and the outboard bearing. The manufacturers are A. L. Ide & Sons, Springfield, Ill.

The same self-oiling features as in the standard "Ideal" are used.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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According to a German paper, underground cables sheathed in glass tubes have been tried successfully at Marseilles, France. The insulation is very reliable, and, the glass tubes being air tight, the cables are thoroughly protected from dampness. Does the glass ever break?

In the recent death of Col. George Waring the engineering fraternity at large loses a valuable and brilliant man, and New York city a real benefactor. His death, from a dreaded disease he had successfully fought against in other days, was a truly sad one.

The electrical and industrial development now going on in Niagara Falls and vicinity is truly wonderful. Over 60,000 horse-power of Niagara power is now in actual use and the end is not yet. The demand is constantly ahead of the supply of current for power purposes.

The telephone business seems to be very prosperous just now. The last statement of the American Bell Telephone Company shows that, during the month closed October 20, an unusually large number of instruments were installed. The independent manufacturers are having a splendid trade, and several of them are rushed with orders.

When he was asked where he expected to bring up after death, a man once said he didn't care much, as he had decided that of the two places he would choose "Heaven for climate and hell for society." Such a choice, if it can be so called, is necessarily final and a man has but one guess. Yet, if the words of a telephone manager are to be believed, there will be, sometime, an opportunity for exchanging opinions between friends as to the respective advantages and disadvantages of the ultimate resting places named.

The telephone man, in a recent circular designed for general distribution in the territory covered by his company's lines, says:

A little while hence, it will be possible for a man in Salt Lake, or Boise, or Helena, to talk with another man, as though face to face, in San Diego, Cal. The knowledge of that fact kindles a hope that by and by a line will cross that other Divide which lies in darkness under the shadow of the valley which we call Death, and that a "far-sound voice" will come to tell us of the beyond.

A system of electric railway transfers between the limits of choice described would be an added advantage.

A NEW MARVEL.

As we go to press an invention of Tesla's is announced which must produce a profound impression all over the world. Tesla has already identified himself with a number of most remarkable scientific advances, and great things may still be confidently expected as the fruit of his earnest and persistent labors, but it is difficult for us to see how he could ever produce a more beautiful result than he now makes known through a United States patent issued this week.

To direct and control to the minutest detail, by a subtle agent, the operations of a mechanism however complicated and ponderous, to change its speed and direction at will, to make it perform an unlimited number of movements, without any tangible connection and from a great distance, is indeed an achievement worthy of the closing days of this century of wonders.

When Bell transmitted the human voice over a wire so that the faintest of its modulations could be recognized, it was a marvelous triumph; when Edison showed his fascinating invention of the phonograph, this, too, was justly looked upon as a wonder; when Tesla first showed the phenomena of the rotating magnetic field, or when he presented the magical effect of a tube of glass brilliantly lighted in his hand, the world stood astonished; when Roentgen announced the epoch-making discovery of the rays bearing his name, the scientific world was thrilled as never before; but we believe that the beauty and importance of the invention Tesla has just announced, in its ultimate developments, will be such as to place it among the most potent factors in the advance and civilization of mankind. The fact that the invention has been thoroughly and practically developed makes its immediate application sure.

In this issue we begin the publication of the clear and exhaustive wording of Tesla's own description of this invention, which will be concluded next week.

THE PATENT-OFFICE COMMISSION.

The ELECTRICAL REVIEW reported a few weeks ago the meeting of the Patent-Office Commission in Chicago, for the purpose of devising means of revising the rules of the office in reference to patents and trade-marks. The commission will hold a public meeting in Washington on November 22. The commission desires to learn what the opinion of those interested is in relation to the bearing patents and trade-marks have upon our foreign commerce, and how far and in what way it is desirable and best to revise the laws relating to the subject. The questions arising are: When a foreigner should date his invention; to whom the patent should be granted in case of the death of the foreign inventor, and whether it is advisable to enact a Federal law to carry out the convention of industrial property concluded at Paris, March 20, 1883.

The difficulty of the foreign protection of trade-marks and the international registration of trade-marks will engage the attention of the commission. The electrical companies are interested in the subject, and should take steps to have themselves represented.

The recent peace jubilees at Chicago and Philadelphia and the Knights' Templar conclave at Pittsburgh were remarkable in many respects, but in none more so than in the beautiful electrical decorations and lighting effects.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The elections were the absorbing topic during the week, and the stock market was neglected. The trading was very light, but the tone was firm. General Electric closed at 81½ bid and 82 asked, a loss of ½ point for the week. Western Union closed at 92¼ bid and 92½ asked, a decline of ¼ point.

The stock of the Kings County Electric Light and Power Company, of Brooklyn, N. Y., has been quite active for the last two or three weeks, the last recorded sale being at 120.

On the Boston exchange, American Bell Telephone closed at 278 bid and 280 asked. Erie Telephone closed the week at 75½ bid and 76 asked. On the Philadelphia exchange, Electric Storage Battery closed at 41½ bid and 41¾ asked.

Wall Street, November 5.

Telegraph Lines in Cuba and Porto Rico.

A press dispatch from Washington, D. C., states that General Greely, chief of the Signal Corps, in speaking of the work to be done in Cuba and Porto Rico, said that the operators and Signal Service men to be sent to these islands would be under the direction of the commanding generals. It was understood that they would be sent there to erect and operate new lines for military business, and to repair the lines already existing. They would not handle commercial business unless especially directed to do so. The question of telegraph lines in these islands is one which promised to be a source of more or less trouble. On this account General Greely declined to express any views, and will make no recommendations for their future management.

In both islands the telegraph lines were the property of the Spanish Government, and were operated by them while in possession. The United States will take charge of these lines, along with other government property, when the Spaniards evacuate, but the disposal of them is a question of considerable importance. They are in a very bad state of repair and have in many cases been destroyed, so that it will take a great deal of work and money to place them in good condition. General Greely does not feel that he has the money to spare or the authority to spend it for placing these lines in repair for commercial purposes unless directed to do so by the commanding generals. Of course, if the government were to retain possession of the lines it would lose nothing by putting them in proper shape, but as they will probably be turned over to the Cuban Government, any money which might be expended on them might be lost.

In Porto Rico, which is now part of the United States, the conditions are somewhat different, but there are a number of people who object to the principle involved in the United States ownership of the telegraph lines in Porto Rico. It is possible that the government may decide to sell them to a private corporation, but this will be a matter for Congress to determine.

The survey for the new electric line from Colorado Springs to Cripple Creek has been completed. The total cost of the road will be $700,000. Power will be obtained from Lake Moraine.

PERSONAL.

Mr. W. C. Macdonald has given a further sum of over $25,000 to the electrical department of McGill University, Montreal.

Mr. J. W. Lattig has resigned his position as superintendent of telegraph and signals for the Lehigh Valley Railroad. He expects to go to Cuba in January on a prospecting tour.

Messrs. C. O. Baker, Jr., the well known platinum merchant, and H. L. Shippy, secretary of the John A. Roebling's Sons Company, returned to New York city last week after an extended tour of Europe. They welcomed their many friends on their arrival.

Mr. W. D. Weaver, editor of the *American Electrician*, has returned to New York city, having been detached from the "Glacier," on which he served as chief engineer during the war. Mr. Weaver had a bad attack of malarial fever, from which he is now recuperating. His many friends in the electrical field will be glad to know that he is home again, after adding to his already creditable record as a naval officer.

Death of Charles H. Summers.

Charles H. Summers, chief electrician of the Western Union Telegraph Company at Chicago, died of heart failure on November 2 in San Francisco, while walking with a friend. Mr. Summers was a Kentuckian and entered the telegraph service in 1854. In 1867 he was made superintendent of telegraph of the Indianapolis, Cincinnati & Lafayette Railroad telegraph lines, and located at Cincinnati. In 1869 he was called to Chicago as chief electrician of the Western division of the Western Union Telegraph Company, by Anson Stager, and had been in the service of this company as electrician ever since. He was very popular and a large circle of friends will mourn his death.

Prizes for Telephone Apparatus.

The American Electric Telephone Company, of Chicago, informs the ELECTRICAL REVIEW that, in competition with other independent telephone manufacturers, it was able to secure one of the two prizes issued by the Omaha Exposition officials for up-to-date telephone apparatus, the Bell company getting the other one.

Novel Effect of Electrolysis.

A curious state of things is said to have been observed in investigating the electrolysis of water-pipes in Dayton, Ohio. It was found that stones and pebbles near the pipes in some cases seem to have been electro-plated with the metal of the pipe, which one of the experts believes has never been observed before.

Telephone News .....and Comment

The directors of the New State Telephone Company, of Ann Arbor, Mich., have declared a third quarterly dividend of two per cent, payable November 15 to stock of record October 31.

The following have been elected directors of the Mansfield, Ohio, Telephone Company: A. F. Remy, John Baxter, S. N. Ford, W. M. Hahn, M. D. Ward, H. T. Manner, L. C. Menert, T. F. Black, Dr. W. S. Mecklem, J. F. Boals, Lewis Brucker.

The directors of the New England Telephone and Telegraph Company have declared a regular quarterly dividend of $1.50 per share, payable November 15 to stock of record October 31. Transfer books will be closed from November 1 to November 14, both days included.

The directors of the Erie Telegraph and Telephone Company have declared a regular quarterly dividend of one per cent, payable November 21, 1898, to stock of record at noon, Saturday, November 12. The stock books will be closed at noon, November 12, and opened on Monday, November 21.

The instrument statement of the American Bell Telephone Company for the month ended October 20 was as follows:

	1898.	1897.	Increase.
Gross output	33,639	23,131	10,508
Returned	11,823	7,145	4 688
Net output	21,816	15,986	5,830
Since December 20:			
Gross output	278.363	185,874	92.489
Returned	120,082	76,251	43,831
Net output	158,281	109 623	48 458
Total	1,077.402	883 472	198,930

The Mexican Telephone Company has instituted metallic circuit service, and is thereby increasing its telephone rental per subscriber from $75 to $125. The subscription to the metallic service is optional, but the company finds a gratifying demand for it at the additional price. The cost of this improved service was $33,000, and has been paid for out of earnings.

The People's Telephone Company, of Wayne and Monroe counties, Mich, held its annual meeting recently and declared a dividend of 10 per cent to stockholders. The following officers were elected: President, Joseph Waltz; secretary, F. L. Edward; treasurer, W. S. Morey; directors, T. J. A. Milliken, Jesse Butler, Joseph Waltz, F. L. Edwards, W. S. Morey and Benjamin Hall.

New York Electrical Society.

At the last meeting of the New York Electrical Society, held on October 27, the following gentlemen, 30 in number, were elected to membership:

Charles E. Speirs, D. Van Nostrand Company, Murray street, New York; H. Ward Leonard, Bronxville, N. Y.; Harold P. Davis, 918 Union street, Brooklyn, N. Y.; John C. Slack, 123 Oak street, Greenpoint, Brooklyn, N. Y.; James H. Mason, 152 East Twenty-third street, New York; W. F. D. Crane, Reynolds terrace, Orange, N. J.; Dr. F. S. Kolle, 273 Prospect avenue, Brooklyn, N. Y.; William A. Brown, Jr., assistant chief electrical engineer Pennsylvania Railroad, Broad street station, Philadelphia, Pa.; Frank D. Sweeten, junior member Valley Brothers & Company, 625 Arch street, Philadelphia, Pa.; William A. Brown, chief electrical engineer Pennsylvania Railroad, Broad street station, Philadelphia, Pa.; Charles Shirley, New York manager Massachusetts office Postal Telegraph-Cable Company, 253 Broadway, New York; Albert Eckert Chandler, Postal Telegraph-Cable Company, 253 Broadway, New York; Edward J. Powers, 45 Cedar street, New York; B F. Hamilton, 510 West Twenty-third street, New York; Mortimer Lewis Newman, electrical engineer, 107 East Ninetieth street, New York; Lawrence Strauss, 120 East 117th street, New York; G. Herbert Condict, chief engineer Electric Vehicle Company, 1630 Broadway, New York; James Appleton, chief engineer construction department Electric Storage Battery Company, Drexel Building, Philadelphia, Pa.; Dr. Jean F. Chauveau, Jr., 216 West 103d street, New York; George N. Moore, assistant superintendent Edison Electric Illuminating Company, Fifty-third street station, New York; James J. McKenna, Maintenance Company, St. Paul Building, New York; H. B. Kirkland, 120 Liberty street, New York; Adolph L. Goldschmidt, 425 East Fiftieth street, New York; John J. Breslawsky, Leonard & McCoy, 118 Liberty street, New York, 1735 Madison avenue, New York; John T. Hunt, Zindars & Hunt, 127 Fifth avenue, New York; Wm. M. Stewart, New York Telephone Company, 15 Dey street, New York; Horace Dowie, 363 Jefferson avenue, Brooklyn, N. Y.; Hiram D. Torrie, Jr., Riverside, N. J.; Henry M. Jackson, president People's Light and Power Company, Newark, N. J.; Dudley Farrand, People's Light and Power Company, Newark, N. J.

Civil Service Positions.

The Civil Service Commission announces that vacancies in the grade of electrical engineer will be filled by examination on December 3. One of the vacant positions is in New York, with a salary of $1,800 per year. The other is at Fort Caswell, with a salary of $900.

ELECTRICAL SURVEY IN THE BOROUGH OF MANHATTAN, NEW YORK CITY.

A PAPER READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, OCTOBER 26, 1898, BY A. A. KNUDSON.

(Concluded from page 279.)

At this time there were no fluctuations of the needle whatever, and consequently no sign of a trolley-current escape from the rails to underground pipes. Tests were made over the same route as during the day, as well as at other places, but although the Lenox avenue line was running (they have an all-night service) no evidence could be obtained of current straying from those conductors to either water or gas pipes. What we did find, however, worthy of mention, was another current, emanating from an entirely different source, passing from the water pipes to the rails, the pipes this time being positive, which, as will be perceived, was the reverse of the polarity found during the day. This current was as perfectly steady as if from a galvanic battery. The difference of potential, however, was low, in some places one-thirtieth of a volt only was found, while in others the reading was two-thirtieths. In my efforts to identify this current I consulted the manager of the power-station which supplied current to the Lenox avenue road, and he obligingly offered to shut down the plant for half an hour during that portion of the night when traffic is the lightest and give me a chance to retest. This was done between the hours of 2.30 and 3 A. M., when both of these electric roads were then shut down so that no possible current could come from either one. The same steady current was found, however, as before, passing from the water pipes into the rails. The voltmeter proving insufficient as a means of completely identifying this current, telephone receivers were used, and with one at each ear there was no difficulty in recognizing the familiar sing of the incandescent dynamo. This test with the telephone was repeated several times by my assistant and myself, so that there could be no possibility of error.

It appears from the tests made that an open-conduit system, or one in which an insulated metallic return is used, effectually confines the current to the conductors provided for it. For this reason it is preferable to the ordinary ground return, especially in large cities, where the space below the streets is so largely occupied with various lines of iron pipes, more or less subject to electrolytic action.

The distances the overhead trolley current would sometimes reach were shown by a rise in voltage when a Union Railway car crossed the tracks of the Lenox avenue road at 135th street. This was found as far down as 116th street, where the latter road branches east and west; in fact, there was no portion of this road where these trolley current fluctuations could not be obtained when cars were passing through 135th street.

Desiring to learn the difference of potential between the elevated railway pillars and water pipes, with the Union Railway, if any, in this part of the city, tests were begun at 157th street (Harlem River) on the Eighth avenue line and continued down as far as 109th street, which is the western terminus of the Metropolitan company's open-conduit system. Rather than make this paper monotonous with long tables of tests some plans have been prepared of different locations in the city, showing where these tests were made, and giving the difference of potential at the points indicated. It may be well to state here that the voltmeter used was a Weston two scale: the lower scale reading to five volts with thirtieth divisions; this scale was used in most of the tests, and accounts for the record being given in a number of cases in thirtieths of a volt. The upper scale read to 150 volts in one-volt divisions

The following is a general description of the method of procedure touching in detail at such points as may be of interest.

The starting point, as already stated, was at 157th street; from this point down to 135th street the tests are given in a table, as well as in plan, Fig. 1; the table giving both day and night tests for comparison, while the plan gives the day tests only.

The Union Railway (overhead trolley), heretofore spoken of as passing through 135th street, terminates at Eighth avenue; in fact, the ends of the two trolley wires of that road are supported by being attached to the "L" structure which, as is well known, passes through that avenue.

Referring to the table, it will be noticed that the reading at 157th street shows that the night test was the same as during the day. It was afterwards discovered that the last car of the Union Railway had not then left the track, which accounts for this reading being higher than the other, as well as a trolley variation being shown. All of the other night tests, however, showed the same indications of an incandescent current as were found on Lenox avenue, as well as at several other places. One feature worthy of notice in the day test, shown in the plan, as well as the table, is the change of polarity found at different points on this section of the road.

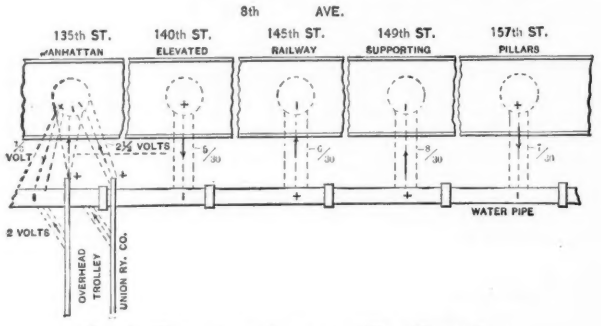


FIG. 1.—ELECTRICAL SURVEY IN NEW YORK CITY.

The current passes into the water pipes and "L" structure from the rails of the trolley road at 135th street (they being positive) from two to two and one-half volts maximum, then along the pipes for five blocks to 140th street, then reverses and passes along the "L" structure for another five blocks to 145th street, where it again reverses and takes the water pipes to another reversal at 157th street.

The cause of this erratic jumping of the railway current up some pillars and down others may be explained in two or three ways, two of which I will mention:

1. Proximity of water pipes to the "L" structure, at some points being closer than at others, offering a more favorable path for this portion of the current.

2. The current passing into the water pipes at 135th street as well as the "L" structure at the same polarity, and possibly at a higher voltage at times to water, may cause this change in polarity at different points along the line.

Location.	Day test 9 to 10 A. M.	Night test 1.30 to 2 30 A. M.
157th street.	"L" + to hydrant $\frac{7}{30}$ volt.	$\frac{7}{30}$ volt "L" + to hydrant.
149th "	"L" − " " $\frac{5}{30}$ "	$\frac{5}{30}$ " "L" + " "
145th "	"L" − " " $\frac{3}{30}$ "	$\frac{3}{30}$ " "L" + " "
140th "	"L" + " " $\frac{3}{30}$ "	$\frac{3}{30}$ " "L" + " "
135th "	Rails U. E. Ry. + to "L" 2½ volts.	$\frac{3}{30}$ " rails + "L" Ry.
135th "	" U. E. Ry. + " hydrant 2 volts.	
135th "	"L" + to hydrant ½ volt.	$\frac{1}{30}$ " "L" + " hydrant.
		Night readings steady throughout.

A few days ago tests were made over this same section of road with almost identically the same readings in each case as prevailed over a year ago. It was noticed, however, that the terminal rails of the Union Railway Company at 135th street and Eighth avenue had recently been replaced by new ones, which appears to be a good illustration of "cause and effect."

Similar conditions also prevail on the section of road below 135th street down to 109th street. At this point the "open-conduit" road has its western terminus. Day tests have shown a maximum reading of one-third of a volt, the rails being positive to "L" pillar, and to water, the night test when Union Railway was not running $\frac{3}{30}$ steady, showing plainly that the current was from that road.

Attention is now directed to the east side of this part of the city, where another branch of the Union Railway is located. Tests made here show even more pronounced results than at the branch running through 135th street to the west side. It may be stated that the power-station of this road is located on the Bronx River in Westchester County.

Something more than a year ago, when these tests were made, this branch had a terminus at Third avenue and 129th street, immediately in front of the "L" station, the cars then passing over the Harlem River at the old wooden bridge, which is now being removed. The cars now pass over the public bridge recently opened to the new terminal at Lexington avenue. Fig. 2 shows the location of the terminal when these tests were made, as well as the difference of potential.

It will be noticed that the maximum reading here was 10 volts, rails positive to "L" pillar, sewer and gas. A test was also made on the Harlem bridge, which showed the same reading, except it was made to gas only, no other pipes being at hand. A few days ago this locality was visited with a view of obtaining any further items which might be of interest for this paper, and workmen were found engaged in removing the rails of this very terminal.

Information was therefore obtained as to the results of electrolytic action on these rails (they having been positive). An impression was taken on paper of the exact size and shape of the end of one of the four rails which composed that terminal switch, the ends of the other rails all being in just about the same condition. Fig. 3 shows a comparison of the size and shape of the rail when new and its present condition; the position of the outlines as to each other being about as shown. From the condition of these rails now, it is quite plain that a large amount of metal has been removed from them by electrolysis. The original size of the rails was furnished by the company supplying the rails, they being 70 pounds to the yard; furthermore, the bottom size of all these rails were cut by the current down to knife edges for several feet back from the ends. These edges were irregular in shape and somewhat jagged in appearance.

Another feature of interest is the condition of the cross-bars or tie-rods which keep the rails in position. These bars, which were originally one and one-half-inches wide by three-

eighth-inch thick, were nearly all so eaten away that the middle portion was missing, the ends protruding from the rails at from 6 inches to 12 inches. Fig. 4 gives a view of one of these bars which was conveniently left behind when the other materials were removed. It is the only one I saw which was intact, and is in a much better state of preservation than the

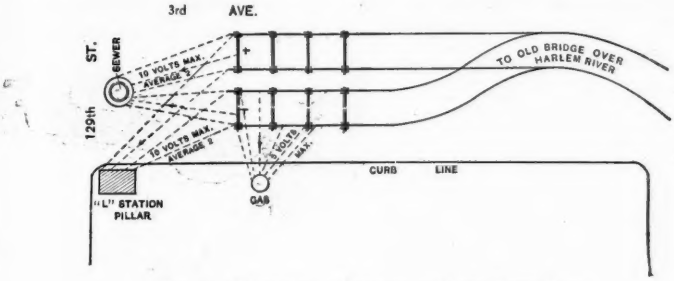


FIG. 2.—ELECTRICAL SURVEY IN NEW YORK CITY.

others, consequently not an average sample.

This specimen is on the table for inspection by those who care to examine it as well as some small pieces, broken off by hand, which were protruding from the rails. Your attention is called to a feature not shown

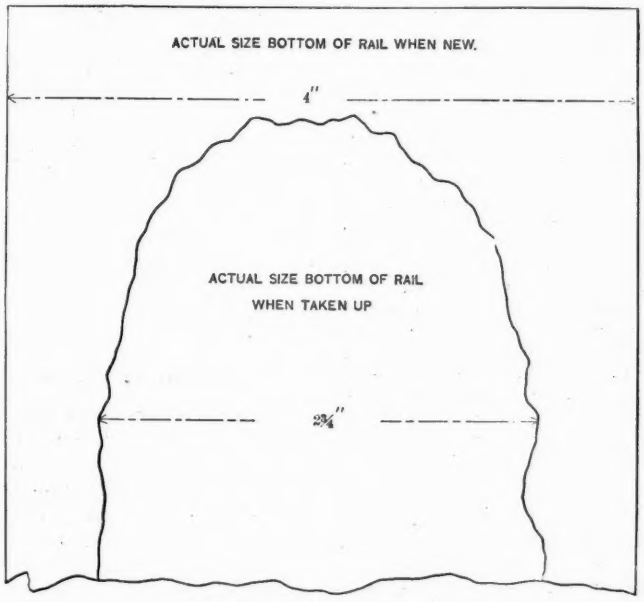


FIG. 3.—PLAN OF RAIL.

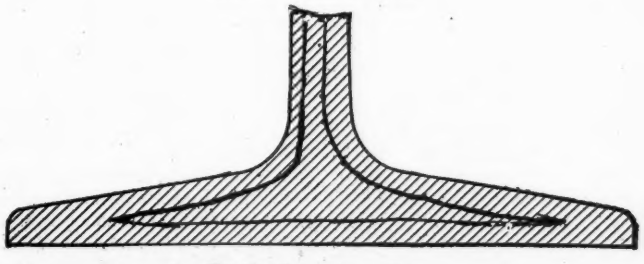


FIG. 3.—SECTION OF RAIL.

in the cut and that is the sharp knife-edge of the side that was deepest in the ground from where the current passed out, somewhat similar in appearance to the sides of the rails above referred to; the ridges and pitting characteristics of electrolysis are also plainly visible in this, and in a lesser degree in the smaller specimens.

Further tests were made in this part of the city, but being not specially important, are omitted until Ninety-third street is reached, from which point to the Battery a plan is given, showing the locations where tests have been made, their voltage and polarity. These tests refer mostly, as you will notice, to the incandescent current, passing at low voltage, ranging from one-thirtieth to one-fifth of a volt. One feature worthy of attention is the lowest reading being generally found at the "L" stations, between pillars under the stations and water pipes. This is accounted for by the fact that as there are water pipes supplied to most, if not all, the "L" stations, they would make a fairly good electrical connection with the structure itself, and, therefore, not much difference of potential could be expected. This point also suggests a method for remedying this condition of affairs. Coming down the west side of the city, I was surprised to encounter a full-fledged trolley current in the extreme lower part of the city. The first intimation was found at Rector and Greenwich streets, it became more pronounced in the vicinity of South Ferry, where, in testing between the rails of the Metropolitan cable road and an "L" pillar, a variation of from one-thirtieth to eight-thirtieth volts was found, the rails positive, and the same reading between the rails and water pipes.

Just why there should be indications of a trolley current in this part of Manhattan Island was difficult to understand, but after making further tests coming up on the east side, this current was found to come from the Brooklyn Bridge. Having pointed out how an overhead trolley, using the water pipes and incidentally the rails as a return, such as is operated on 135th street, can spread its influence, so to speak, for a distance of over 20 blocks in either direction north and south, through various pipes, railway structures, etc., the existence of this current from the bridge permeating underground metals through a large portion of the lower part of the city is accounted for.

The tests were continued at the New York entrance of the Bridge, and at the pillars which stand in the street just west of the Third avenue cable railway I found the readings as follows: At one pillar a maximum of three volts, average one and one-half volts, pillar positive to Third avenue cable rails. At another practically the same reading. Further up Park row, at the corner of Chambers street, pillar positive to cable rails, one volt maximum; water positive to cable rails, one-half volt; pillar positive to water, one third of a volt.

All of these tests were made nearly a year and a half ago. A few days ago tests were made over this same ground, and at places where a difference of potential of three volts maximum existed at that time it is now found to be three and one-fifth volts. pillars positive as before to rails of Third avenue cable and also to water pipes, showing in all probability that this current has been during all this time actively and unceasingly passing down the pillars which support the "L" station at this place, as well as the Bridge crossing the street, and out from their foundations to other metals as stated, and now a fifth of a volt more for good measure.

In the light of present knowledge on this subject the very serious question presents itself to any practical mind here present, in what condition would we expect to find the anchor bolts and iron foundations of these pillars, if excavations were made at their base?

In Mr. Farnham's excellent paper, read before this institute four years ago, he showed that but a small fraction of a volt was necessary to establish electrolytic action between metals.

What then can be expected from an incessant action of from one and one-half to three and one-fifth volts jumping out of these foundations during the past year and a half or perhaps two years.

Further tests at the New York entrance of the Bridge at pillars nearest the four-loop tracks show that they are negative to rails of these tracks with maximum voltage of three and one-quarter, an estimated average of two and one-quarter.

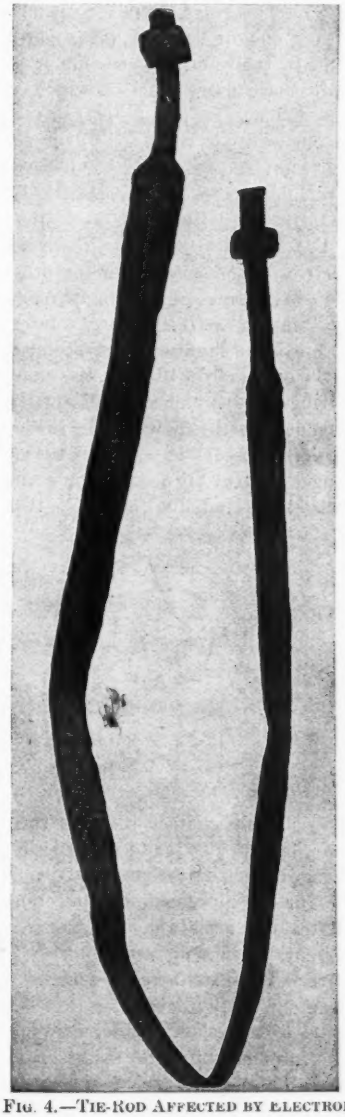


FIG. 4.—TIE-ROD AFFECTED BY ELECTROLYSIS.

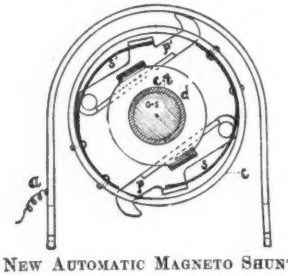
These tests were made on three different days at different times of the day, the highest maximum reading as above being taken at 4.45 P. M.

The other tests, one made during the so called rush hour between 5.30 and 6 P. M., where a maximum reading of two and one-fifth volts noted at track 1 did not vary much from the tests made in the afternoon of another day at from 2 to 2.30 P. M. at track 4, where the voltage was found to be two and one-third maximum. Previous

(Concluded on page 300.)

A New Automatic Magneto Shunt.

The accompanying illustration shows a new and unique way of automatically shunting the armature windings on exchange magneto bells. G–S represents the gear shaft, which is shown in section at a point near the driving-dog D, which is riveted and brazed on to the crank-tube C–T, which is also shown in section. P and P prime are two pawls which are mounted upon a brass cup-shaped disk C, and which are actuated radially outwardly by two flat steel springs S and S prime. Either one or both of these pawls while in their normal condition press against a contact band A which is mounted on the pole-pieces, so that its curvature is concentric with the gear-shaft and insulated by means of hard rubber blocks and are electrically connected with the commutator end of the armature coil. The pawls are electrically connected with the other end of the armature winding through the frame of the magneto generator. To break the shunt or short-circuit, as in the operation of turning, the crank driving-dog D, which has two laterally-extended ears, as shown by the shaded portion, engages two upwardly turned flanges of pawls P and P prime and pulls them radially inwardly, thus



A NEW AUTOMATIC MAGNETO SHUNT.

breaking the contact between them and the insulated band A until they engage or lock on the gear-shaft, when the further movement of the crank rotates the armature and generates current, which is delivered to the line wires. The patent on this device is owned by the Williams Electric Company, of Cleveland, Ohio, who use this form of automatic shunt on all of their high-grade exchange magneto bells.

The Boston & Maine Railroad is to equip its Portsmouth & Dover branch, about 10 miles in length, for electrical operation. It is probable that the change from steam to electricity will be made early next Summer. The power for this line and for the Portsmouth, Newcastle & Rye Electric Street Railway line will be furnished from a power-house on Noble's Island. The cost of equipping the line with electricity is expected to be about $12,000.

TESLA'S LATEST INVENTION.

The following is the text of a patent issued this week to Nikola Tesla, which will undoubtedly prove of world wide interest. The language of the author is given in full:

The problem, for which the invention forming the subject of the present application affords a complete and practicable solution, is that of controlling from a given point the operation of the propelling engines, the steering apparatus and other mechanism carried by a moving object, such as a boat, or any floating vessel, whereby the movements and course of such body or vessel may be directed and controlled from a distance, and any device carried by the same, brought into action at any desired time.

So far as I am aware, the only attempts to solve this problem, which have heretofore met with any measure of success, have been made in connection with a certain class of vessels, the machinery of which was governed by electric currents conveyed to the controlling apparatus through a flexible conductor. But this system is subject to such obvious limitations as are imposed by the length, weight and strength of the conductor which can be practically used, by the difficulty of maintaining with safety a high speed of the vessel or changing the direction of movement of the same with the desired rapidity, by the necessity for effecting the control from a point which is practically fixed, and by many well understood drawbacks inseparably connected with such a system.

The plan which I have perfected involves none of these objections, for I am enabled by the use of my invention to employ any means of propulsion, to impart to the moving body or vessel the highest possible speed, to control the operation of its machinery and to direct its movements from either a fixed point or from a body moving and changing its direction, however rapidly, and to maintain this control over great distances, without any artificial connections between the vessel and the apparatus governing its movements, and without such restrictions as these must necessarily impose.

In a broad sense, then, my invention differs from all of those systems which provide for the control of the mechanism carried by a moving object and governing its motion, in that I require no intermediate wires, cables or other form of electrical or mechanical connection with the object, save the natural media in space. I accomplish, nevertheless, similar results, and in a much more practicable manner, by producing waves, impulses or radiations, which are received through the earth, water or atmosphere by suitable apparatus on the moving body and cause the desired actions, so long as the body remains within the active region or effective range of such currents, waves, impulses or radiations.

The many and difficult requirements of the object here contemplated, involving peculiar means for transmitting to a considerable distance an influence capable of causing, in a positive and reliable manner, these actions, necessitated the designing of devices and apparatus of a novel kind in order to utilize to the best advantage various facts or results which, either through my own investigations or those of others, have been rendered practically available.

As to the part of my invention which involves the production of suitable waves or radiations and the conveying of the same to a remote receiving apparatus capable of being operated or controlled by their influence, it may be carried out in various ways which are at the present time more or less understood. For example, I may pass through a conducting path, preferably enclosing a large area, a rapidly varying current and by electro-magnetic induction of the same, affect a circuit carried by the moving body. In this case the action at a given distance will be the stronger the larger the area enclosed by the conductor and the greater the rate of change of the current. If the latter were generated in the ordinary ways, the rate of change, and consequently the distance at which the action would be practically available for the present purpose, would be very small; but by adopting such means as I have devised, that is, either by passing through the conducting path currents of a specially designed high-frequency alternator, or better still, those of a strongly charged condenser, a very high rate of change may be obtained, and the effective range of the influence thus extended over a vast area, and by carefully adjusting the circuit on the moving body so as to be in exact electro magnetic synchronism with the primary disturbances, this influence may be utilized at great distances.

Another way to carry out my invention is to direct the currents or discharges of a high-frequency machine or condenser through a circuit, one terminal of which is connected directly or inductively with the ground and the other to a body, preferably of large surface and at an elevation. In this case if the circuit on the moving body be similarly arranged or connected, differences of potential on the terminals of the circuit, either by conduction or electrostatic induction, are produced, and the same object is attained. Again, to secure the best action, the receiving circuit should be adjusted so as to be in electro-magnetic synchronism with the primary source as before, but in this instance it will be understood by those skilled in the art that, if the number of vibrations per unit of time be the same, the circuit should now have a length of conductor only one half of that used in the former case.

[Concluded next week.]

A New Telephone Switchboard.

The American Electric Telephone Company, of Chicago, has just got out a new style of telephone switchboard which embodies many new and novel ideas for which they make strong claims. A feature of the new board is a tubular drop, illustrated herewith. It is made so that the coil may be removed without touching the adjustment of the armature,

TUBULAR DROP FOR A NEW TELEPHONE SWITCHBOARD.

and the adjustment is so good and the air gap so small between the core and armature that the drop will fall easily with ordinary series telephones. In other boards of this description it has often been found necessary to change ringing coils on telephones in order to signal the switchboard drop. This is not necessary in the new American board. There are claimed to be many points of superiority in arrangement of the jack and plug for this apparatus, notably the arrangement for fastening the cord in the plug, whereby it is impossible to break the connection—a point that gives no end of trouble in poorly constructed work. The cam is a very simple and substantial arrangement, and only one lever is used in ringing both ways and listening in the circuit. The operator can talk with one subscriber and ring another with the same lever.

The Largest Sale of Boilers.

The Stirling Company has just made what is said to be the largest boiler sale on record in having contracted with the William Cramp & Sons' Ship and Engine Building Company, of Philadelphia, for 40,000 horse power water-tube boilers of the Niclausse type, for a battle-ship and cruiser, which is under construction at the Cramp yards for the Russian Government. The Stirling Company has not only acquired exclusive rights to the manufacture of the Niclausse boiler in this country, but also of the Yarrow and Mosher types, all of which were tested under trying conditions in the recent war.

The shops of the Stirling Company, although doubled last Spring to provide for their increasing business in the manufacture and sale of Stirling boilers, are now crowded to their utmost, and ground will be broken in the course of a few weeks for another large extension. The sale of Stirling boilers for the 10 months of this year were almost three times as large as in the next largest year of the company's history.

Frink's Reflectors.

For 40 years the house of I. P. Frink, 551 Pearl street, New York city, has devoted its energies to designing, inventing and placing upon the market reflectors for improving the lighting of buildings of all sorts. The group of illustrations presented herewith shows a number of the standard types developed by this firm which, through use and experience under various circumstances, have become standarized and are now considered to be staple types.

In Fig. 1 is shown a deep reflecting shade, enameled dark green outside and lined with silvered corrugated mirror or opal glass. Fig. 2 shows a flat reflecting shade for stores, factories, workshops, ceiling lights and general use. A special window reflector is shown in Fig. 4. It is lined with silver-plated corrugated glass and is placed in the top of the window near the front glass, reflecting the light inward and downward. The reflector is out of the way and concealed from view, at the same time concealing the direct light from the eyes of the observer and giving a strong, even light where wanted. A border light is illustrated in Fig 7. It is made of extra bright corrugated metal, with wire guard, strongly made on special angles, and with strict regard to the reflection of light. It is wired ready for use, but does not include sockets and lamps. A sectional glass reflector with a brass corona for use in banks, office and public buildings is shown in Fig. 3. The finish may be polished or old brass as desired. An elaborate and handsome crystal hanging fixture is shown in Fig. 6. It is richly trimmed with cut-glass prisms and prismatic chains, and makes a very effective electric fixture. A combination fixture, especially for use in schools and colleges, is illustrated in Fig 5. It is equipped with a sectional glass cluster reflector and has been adopted for use in the new school buildings of New York city, all of which will use from 150 to 250 of them.

Fig. 1.—Deep Reflecting Shade.

Fig. 2.—Flat Reflecting Shade.

Fig. 3.—Sectional Glass Reflector.

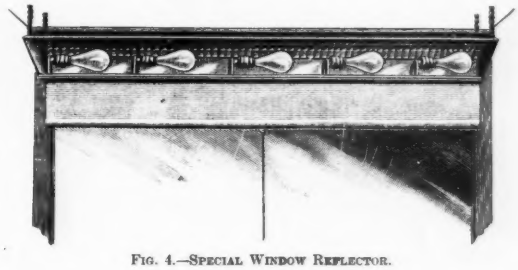


Fig. 4.—Special Window Reflector.

Fig. 5.—Combination Fixture.

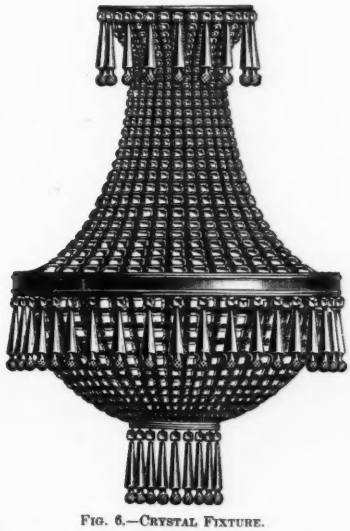


Fig. 6.—Crystal Fixture.

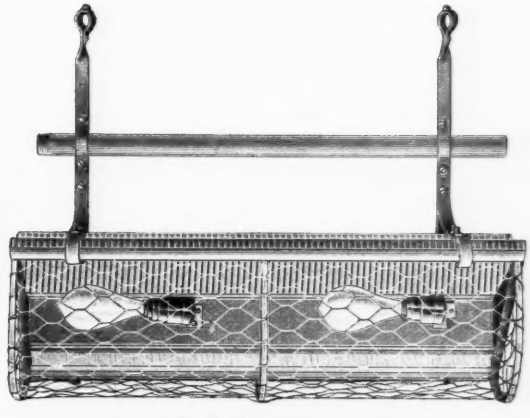


Fig. 7.—Border Light.

Examples of Frink Reflector Specialties.

Niagara Power in Buffalo, N. Y.

Two recent contracts for the use of Niagara power in Buffalo are with the Curtiss malt house and elevator, using five 50 horse-power and one 15-horse-power Tesla induction motors for operating elevators, etc.; and the McKinnon Dash Company, using one 100-horse power Tesla motor, which will be coupled to a direct-current generator, supplying power for small direct-current motors and lights, and from the other side of the Tesla motor there will be belted a Thomson welding dynamo. This will make altogether quite an interesting electrical installation. The use of Niagara power in the Great Northern elevator has been very successful, and the Great Northern Elevator Company have recently increased their motor equipment by two 75-horse-power Tesla motors, so that they now have a total capacity of about 1,200 horse-power.

ELECTRIC LIGHT FLASHES.

Electric light and ice plant of Edwardsville, Ill., Electric Light and Power Company has been destroyed by fire at a loss of $40,000; insured for $16,000. It was owned and operated by St. Louis capitalists.

The Ironton, Ind., electric lighting station, which is the property of the Fort Wayne Electric Corporation, was burned to the ground a few days ago, entailing a loss estimated at $8,000, which is partially covered by insurance. The plant will be rebuilt immediately.

At a meeting of the Wilkes Barre, Pa., Electric Light Company, the old officers and directors resigned and the following were elected in their stead: Abram Nesbit, president; J. W. Hollenback, vice-president; E. W. Mulligan, secretary and treasurer; Directors, Abram Nesbit, J. W. Hollenback, E. W. Mulligan, John Flanagan, Liddon Flick, W. P. Billings, E. H. Jones, Charles W. Lee, W. A. Lathrop, E. C. Jones and Irving A. Stearns.

The Hagerstown, Md., Electric Light Company has a hoodoo. They are erecting a new station building; twice it has been blown down by wind storms. While workmen were erecting the last truss that would have finished the roof supports, the truss became unmanageable and, in swaying, fell, carrying down with it all the other trusses and the walls. Thirty workmen were in the building; only three, however, sustained any injuries. Two of these will likely die.

Mr. J. George Kaelber, of Rochester, N. Y., well known as a successful promoter of electric light and power companies and a former representative of the Western Electric Company, of Chicago and New York, has just completed the sale of the majority stock held by him in the Beacon Electric Company, of Lansingburgh, N. Y. The purchasers were capitalists of Troy and New York city. The Beacon Electric Company was organized in 1896 by Mr. Kaelber, who has been its president and manager ever since. The company was capitalized at $100,000, all of which was paid in. In spite of strong competition, a good business has been done, and dividends have been regularly paid. Mr. Kaelber will hereafter devote his time to the Beacon Light Company, of Chester, Pa., and a new company he is about to incorporate.

ELECTRICAL SURVEY IN THE BOROUGH OF MANHATTAN, NEW YORK CITY.

(Concluded from page 297.)

to any use of electricity for operating cars on the Bridge it had been known that currents were escaping to that structure from trolley lines in Brooklyn, and passing over would find their way through the city by underground pipes, etc., and thence crossing the river arrive back to the power-station in Kent avenue.

The polarity of both of these railway systems now operated on the Bridge indicates that these currents escape from their lines; but it is also quite likely that currents are even now coming over the Bridge as they were a year ago. Only an extended investigation would determine these points, even if it were desirable that they should be known.

Let us now take up the investigation made on the Bridge to determine if possible the movements of straying trolley currents and their possible effect on the cable terminals. In view of the importance of this matter I regret not being able to make it more thorough than here stated, as it would involve not only a fortnight's work at least, but the shutting down of the bridge plant for a time, which could hardly be expected under the circumstances. Such facts are represented, however, as it was practicable to obtain. Recognizing the necessity of having every detail as to the construction, location, etc., of these terminals before being able to intelligently consider the matter, plans prepared by the bridge engineers were obtained, which are given in Figs. 6 and 7. These show the exact construction of the cable terminals and anchor plates, besides other information regarding construction, all of which is from an official source.

In regard to the construction of the cable terminals, as most of us know, the main cables are made up of

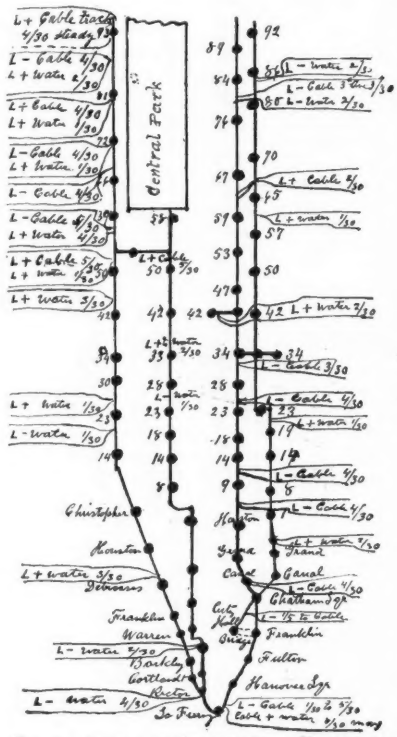


FIG. 5.—POINTS OF OBSERVATION, ELECTRICAL SURVEY OF NEW YORK CITY.

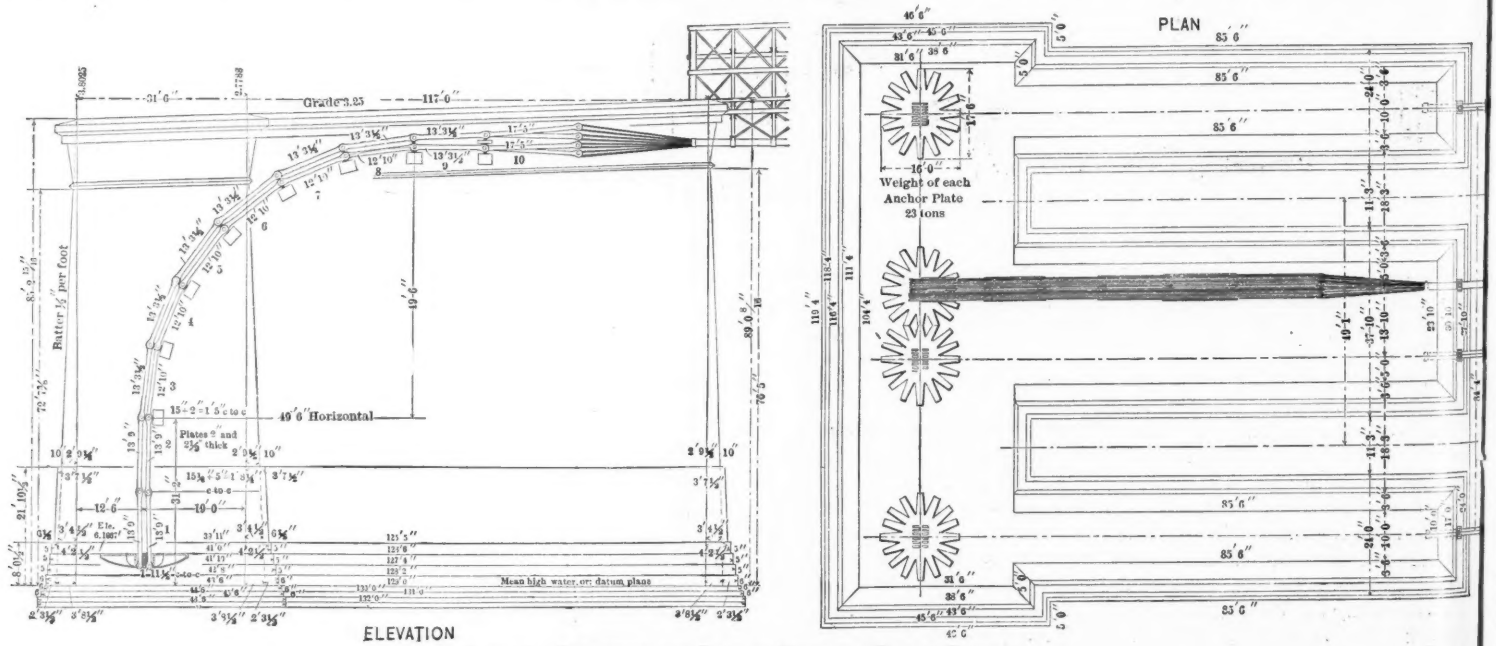
18 strands, or smaller cables, which are practically continuous, the wire running back and forth from New York to Brooklyn, passing through the holes at the ends of heavy steel bars or links at each place, and the ends of the single wire being finally fastened by a rigid screw coupling. These two rows of steel bars of nine each, which are attached to the cable strands, one row placed over the other, as shown in Fig. 6, pass down with a graceful curve into solid stone masonry to the anchor-plates, and are secured to them by heavy steel bolts passing through the eyes at the ends, as shown in the figure. The anchor-plates are in shape somewhat longer one way than the other (see plan), and each being a single piece of cast-iron, weighing 23 tons.

Coming now to the tests it will be noticed that there is no possibility of reaching the anchor-plates other than by connecting through the cables themselves, and they being firmly attached to the structure, cables and all are practically one conductor; and a connection on the structure would mean connection with the cables, and consequently with the anchor-plates.

This point therefore being settled, the next thing was to obtain a suitable ground, and on the suggestion of Mr. C. B. Martin, the electrician of the Bridge, one of the railway cables was used during that portion of the day when it was not in operation for hauling a Bridge train. This was a convenient as well as a good ground. The cable surface being polished brightly through friction in passing over the pulleys, it was possible to obtain a good contact, and as it passed over the large drums in the engine room, which were on foundations connecting with engines, water pipes, etc., it was probably the best ground independent of the structure obtainable. The connection to the structure was made by the use of a two-inch screw clamp, the wire to the voltmeter being attached to it by the simple means of a screw and washer. Two of these clamps were generally used in nearly all of the previous tests, as they were found very convenient for attaching and detaching quickly to and from hydrants, pillars, etc. The first test under these conditions was made just over the Brooklyn anchorage, where the structure was found to be positive to the ground, with a difference of potential of two and three-fourths volts maximum; estimated average, one and three-fourths volts.

At the Brooklyn tower another ground connection was made to a water pipe, which ran down the side of the tower, and is intended for use in case of fire on the Bridge. At this point the reading was three and three-fourths volts maximum, average two and three-fourths, Bridge structure was as before positive. At center of span, structure positive at first, with two and one-fourth volts maximum, but during the readings there were two reversals, one of them only remaining long enough to obtain a reading, which was one and one-fourth volts maximum, structure negative. At the New York tower, structure positive to cable ground, with trolley variations ranging from three-fourths to three volts, average two volts. At New York anchorage, maximum two and three fourths volts, average two volts, structure positive, to ground.

Other tests were made to determine the polarity of the rails of the Bridge trains, and they were found positive to the structure, the same as the rails of the trolley road heretofore tested. Let us now consider



FIGS. 6 AND 7.—ELEVATION AND PLAN OF BROOKLYN BRIDGE TERMINAL.

the question of the electrolytical conditions of the cable anchorages, as this point appears to be of high importance in this matter, if not the

key to the whole situation in determining whether or not electrolytic action is going on.

1. These anchorages are composed of solid stone masonry, and are put together with the highest quality of cement; there is no brickwork or mortar in their construction

2. The 23 tons of iron composing the plates are set about 80 feet below the top of the anchorage. The distance from the bottom of the plates to mean high water is three feet eight inches at the New York end, five feet at the Brooklyn end; there is no earthy matter, salts or alkalies, such as is found prevalent in the streets which go to make up an electrolyte, so I am informed, in any part of this structure.

I was at first apprehensive that on account of the comparatively short distance between mean high water and the plates at both anchorages there might be opportunity for salt water to reach the plates through seepage or capillary attraction and thereby produce such an electrolyte as to cause corrosion, but have been informed that it is not possible for salt water to reach these terminal plates on account of the distance from the river, the anchorages being over 900 feet from the towers which stand at each side of the river. Even allowing 100 feet for the salt water to work back, there is still ample margin as to distance before salt water can reach these plates; besides this, one of the Bridge engineers showed me a plan of the construction of the foundation under each anchorage, which consists of heavy timbers 10 inches by 10 inches, and some 12 inches by 12 inches, arranged in four to seven layers, placed a short distance apart, and the intervening spaces filled in with concrete cement.

In view of the tests, therefore, that have been made, showing the structure and cables to be positive at both ends, it is quite possible that a portion of the currents straying from the trolley lines, and possibly from the Bridge service, find their way out of the anchor plates through the dampness of the stonework of these anchorages. The construction of these anchorages, however, is such, as I have endeavored to set forth, that it seems reasonable from the general construction of these piers that the mass of stone and concrete surrounding these plates will not constitute an electrolyte such as would favor electrolysis, and thereby cause corrosive action on them.

One of the Bridge officials informed me that a certain authority had reported that electrolysis would not attack cast iron, consequently their cast iron anchor plates were exempt from such danger. In the light of recent experience in other cities, that theory is now untenable; for instance, I will quote a few extracts from a pamphlet, giving the reports of four experts, besides that of the secretary of the Water Board of the City of Dayton, Ohio, embodying an estimate of cost for repairing the damage.

Mr. E. E. Brownell, C. E., states: "To my surprise I have found in this city a six-inch water-main that was corroded to the depth of one-quarter of an inch where the voltage did not average over 1.5 to two volts positive to the rails, therefore it is impossible to establish a certain voltage that will cover all cases for low readings."

The following extracts are quoted from the report of Mr. J. H. Shaffer, metallurgist:

He says: "In accordance with instructions from the board, I have made a careful inspection of the cast-iron water-mains at 15 different locations in the city," and then gives the results of excavations, etc., two of which I will quote.

1 "This excavation was made at the corner of Washington and Mound streets. It exposed a six-inch main and a 10-inch tee; the pipe was laid in 1874, and the tee in 1888; both were subjected to electrolytic action for about 10 years. Both pipe and tee showed great evidence of electrolytic corrosion, the pipe being damaged to an alarming degree, with holes pitted from one-eighth to five-sixteenths of an inch in depth, and covering a large portion of the same. . . . . The lead calking was found to be in bad condition, and showed perceptible evidence of leaking. The pipes at this point were nine volts positive to the rails.

2. "This excavation was made on Germantown street, near Krug. It uncovered a six inch pipe. This pipe was electrolytically corroded in about the same proportion, with other conditions identical. A lead service pipe was also exposed at this point, and was found to be entirely destroyed."

A quotation from the report of the secretary on an approximate estimate of the cost of replacing water pipes damaged by electrolysis, caused by electric railway currents, may also be interesting.

He says: "In calculating the cost of replacing the pipes in the whole affected territory, it is estimated at $77,208.80.

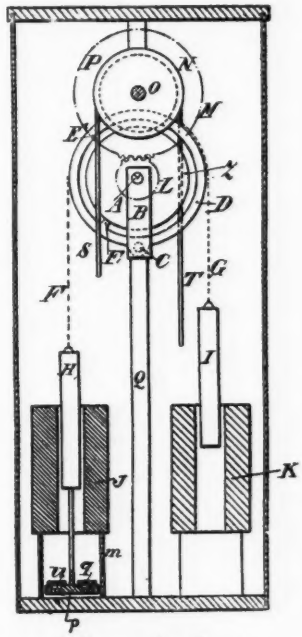
"There is 17,513 feet of pipe that shows a voltage of from two to nine volts positive, and from pieces of pipe removed where electrically charged to this extent, it is found that they have deteriorated 50 per cent in four years.

"Where they were required, when laid, to withstand a hydrostatic pressure of over 300 pounds per square inch, when tested by J. H. Shaffer, iron expert, after being subjected to 4.5 volts for four years, leaked at 150 pounds pressure."

He also states the following: "At 4.5 volts it has been shown that a six-inch pipe can certainly become useless in five years."

I have quoted thus freely from this pamphlet for two reasons, one to show that it is a mistake to suppose that cast-iron is not subject to corrosion by electrolysis produced by railway currents, and also to show the penalty to which a city is subjected through permitting such conditions to exist so long that they cause such heavy damages to its property. In the light, therefore, of what has been shown to be the state of affairs in the upper part of this city due to escaping railway currents, as well as the experience at Dayton, Ohio, it appears to be the duty of engineers to exercise every possible precaution against the effects of this invisible element of destruction, which, if left to itself, will certainly shorten the life of valuable city property.

The damages already done and threatened to public works in England by electrolysis has led to the establishment of regulations to prevent such action in the future, and similar legislation may be expected in this country should these conditions be allowed to continue. One of the provisions in the regulations prescribed



A FRENCH ARC LAMP.

by the British Board of Trade may be of interest just here. It is to the effect that if the pipe is negative to the rails the potential difference shall not exceed 4 5 volts, and if the pipe is positive to the rails the potential difference shall not exceed 1.5 volts. This appears to be very liberal for the railways, in view of the experience in cities on this side of the water; it is probable, however, they will be made more stringent as future experience in this direction dictates.

I have purposely avoided elaborating any particular scheme for preventing damage by stray railway currents in this paper, for the reason that methods are perfectly well known to railway companies for confining currents to their proper conductors, such as efficient bonding and providing a return that will leave no inducement for the current to seek underground pipes, in preference to a legitimate conductor. It is simply a question of additional expense. Referring to the incandescent light current which was found prevailing everywhere in this part of the city, from the Harlem River to the Battery, passing between all kinds of underground metals, and some on the surface, I do not consider these currents as particularly dangerous at the moment on account of their low voltage, but as before stated, it having been established that a fraction of a volt difference of potential will cause electrolytic action, it then comes down simply to a question of time, when those straying incandescent currents will have to be seriously considered.

In conclusion, I wish to say that these remarks regarding possible damage to public structures through the action of electrolysis, have been made with no desire on my part to appear as an alarmist, but to present simple facts as found in these investigations. I believe that too little attention has heretofore been paid to this matter by any of us; perhaps for the reason that electrolytic action being invisible, as well as noiseless, it has thus escaped attention, and its baneful effects not fully appreciated. It is my opinion, however, that ordinary caution would suggest that periodical tests should be made in every city by competent parties where a trolley road using a ground return is in operation, and the reports placed before those having authority to deal with the matter. In this way threatened damage by electrolysis to water and other pipes, as well as bridges, might be arrested and finally controlled.

A French Arc Lamp.

Great interest is being taken in the development of the arc lamp, and ELECTRICAL REVIEW readers will welcome any new inventions tending toward the improvement of its condition. The illustration herewith shows the working parts of an arc lamp for which a patent was recently granted to French inventors.

The essential feature of the new mechanism is the brake arrangement. The lamp works on the equilibrium principle like most continental lamps, and it is claimed by the inventors that there is always a "balance" between the two carbon-holders

By referring to the cut the mechanism may be seen in detail. In the figure N P indicates the carbon-holder drum wound differentially, Z a balance wheel operated by a clock train from the drum N P. D is a brake ring mounted on the axis of the balance Z. J and K are the solenoid coils operating the brake ring D. S and F are the cords running over the drum N P, to which are attached the carbon-holders.

In operation the series coil K applies the brake and the coil J releases it. The ring D has a slight projection E on its interior. This projection acts as a brake on the drum N P. The ring D is set slightly eccentric to the axis of the drum N P. On the arc lengthening the pull exerted by the core I becomes weaker finally, allowing the core H to revalue the ring D until it is out of contact with the drum N P. The carbon then falls and the brake is again set.

The inventors claim a practically "continuous" movement of the carbon. Aside from the brake mechanism there seems to be no striking variation from other lamps of the kind.

ADVANCE INFORMATION

New Incorporations.

CHICAGO, ILL.—The Cass & Aaron Company has been incorporated to manufacture electrical machinery and supplies; capital, $10,000; incorporators, J. Aaron and Phillip Cass.

DALLAS, TEX.—The Sutton-Steele Electrical Company, with a capital of $20,000, has been incorporated; incorporators, Walter L. Steele, Henry M. Sutton, Emmet A. Ellis, J. L. Sale.

PLYMOUTH, WIS.—The Wisconsin Storage, Electric and Water Company has been incorporated; capital stock, $25,000.

AUGUSTA, ME. — The American Motor Company has been incorporated; capital, $25,000; incorporators, Alexander Fisher and Frederick R. Blount, of New York city.

ROCHESTER, N. Y.—Higgins, Olmstead & Company has been incorporated to manufacture gas and electric fixtures; capital, $10,000; directors, Ezra M. Higgins, of this place, and others.

NEW YORK, N. Y.—The Edison Junior Electric Light and Power Company has been incorporated for the purpose of manufacturing, selling, licensing or otherwise dealing in electric or storage batteries and electrical appliances, etc. Thomas A. Edison, Jr., Valentine Robinson, H. C. Hepburn, E. A. Drake, C. S. Henry, R. M. Jordan, J. G. Batterson, Jr., and F. J. Stone, all of this place, incorporators.

NEW YORK, N. Y.—The New York Gas and Coke Company has been incorporated, with a capital stock of $500,000, to manufacture and supply gas and electricity for public and private purposes in this place. The directors are Edward H. Childs and James A. Hawes, of New York city, and Frederic E. Mygatt, of Brooklyn.

NEW YORK, N. Y.—The Fowler Switchboard and Telephone Company has been incorporated to manufacture telephone and other electrical fixtures; capital stock, $5,000; directors, John T. McRoy, of this place; Samuel B. Fowler and L. Victor Heckles, of Brooklyn.

WATERBURY, CT.—The Waterbury Battery Company has been incorporated by C. Platt, Charles B. Schaumacht and C. M. Platt; capital stock, $10,000.

CLEVELAND, OHIO — The Sands Electric Company, of this place, has been incorporated, with $10,000 capital, to manufacture all kinds of electrical appliances; the incorporators are L. Sands, Edward Velhagen, F. B. Skeels, C. R. Hunt and O. A. Bejck.

INDIANAPOLIS, IND. — Electric Therapeutic Manufacturing Company has been incorporated, with a capital stock of $5,000.

PEORIA, ILL.—Diamond Meter Company has been incorporated by E. H. Cough, W. E. Heyle, A. B. Fink and O. A. Scheefer; to manufacture electric meters and other appliances; capital stock, $30,000.

WARSAW, IND.—Warsaw Electric Company has been incorporated by Noah J. Clodfelter, A. T. Spencer, Charles J. Lohman, J. C. Hamilton; capital stock, $30,000.

OAKLAND, CAL. — Oakland Messenger, Burglar and Fire-alarm Company has been incorporated by Albert Aucker, Henry H. Beck, Frederick Kahn, Philip Marx, Edward I. Wolf; to build and operate telephone and telegraph lines, conduct a general messenger business, etc.; capital stock, $20,000.

DALLAS, TEX.—The Sutton-Steele Electrical Company has been incorporated by Walter L. Steele, Henry M. Sutton, Emmett A. Ellis and J. L. Sale; capital stock, $20,000.

NEW YORK, N. Y.—Fire-alarm Telephone Signal Company has been incorporated; capital, $100,000; amount paid in, $250. Incorporators, Thomas R. Brown, New York city; L. S. Filbert, John Lamon, Albert Goldstein and F. R. Shattuck, Philadelphia.

BROOKLYN, N. Y.—The Electric Current Company has been incorporated; capital stock, $3,000. Directors, John W. Cleary, of 186 Remsen street, Brooklyn, and others.

ROCHESTER, N. Y.—Standard Electric Construction Company has been incorporated; capital, $5,000. Directors, Edgar H. Freeman, of 6 Lloyd Park, Rochester, and others.

WILMINGTON, DEL.—Judge Spruance has granted a charter to the Electric Press. Incorporators, H. T. Price, J. A. Currey and John T. Mullins. The capital stock is $20,000.

New Telephone and Telegraph Companies.

PORTLAND, ME.—The Greene Telephone Company are extending their lines to Winthrop. They have already secured admission into Lewiston.

HAMMONDSPORT, N. Y.—The Postal Telephone and Telegraph Company has been granted a franchise allowing it to erect poles in and through the corporation of the village. The line is to run from Watkins through Tyrone, Wayne and this place to Bath.

HAMBURG, PA. — Superintendent Lerch, of the Pennsylvania Telephone Company, has just closed a contract for a new line between this place and Auburn, taking in Port Clinton, Pinedale and Auburn. Work on the new line will be commenced at once.

LOUISVILLE, KY.—The telephone line from Flemingsburg to Maysville has been sold to J. W. Chambers.

SUMMERVILLE, PA.—The Summerville Telephone Company will extend its lines to Big Run and Eleanora.

DICKSON, TENN.—A telephone line will be constructed from Dickson to Charlotte.

CARLETON, MICH.—The People's Telephone Company, of Wayne and Monroe counties, held annual meeting recently, and issued a dividend of 10 per cent to stockholders, and elected the following officers: Joseph Waltz, president; F. L. Edward, secretary; W. S. Morey, treasurer.

WILLIAMSPORT, PA.—The new line of the Central Pennsylvania Telephone and Supply Company between this place and Renovo is about completed. The poles have all been erected, and the stringing of the wires will begin in a few days.

NEW PHILADELPHIA, OHIO—The Tuscarawas Home Telephone Company has been incorporated by James S. Bailey, Jr., Frank W. Bainbridge, John W. Yeagley, O. S. Welty and J. H. Mitchell to operate a telephone system in and between New Philadelphia, Dover, Uhrichsville, Dennison and New Philadelphia, Canton, Carroll, Cadiz, Cambridge, Coshocton, Millersburg, Wooster and neighboring villages. The capital stock is $75,000, and headquarters in New Philadelphia, Tuscarawas County.

Electric Light and Power.

FORT SMITH, ARK. — The Fort Smith Traction, Light and Power Company has been incorporated; capital, $200,000; president, Samuel McLeod.

LITTLE ROCK, ARK.—The South M'Allister Electric Light Company has been incorporated; capital, $25,000; president, L. G. Graham.

FORSYTH, GA.—W. A. Pye, City Clerk, may give information concerning proposed purchase of electric light plant.

JOPLIN, MO. — The Joplin Illuminating Company has been incorporated by John C. Porter, Harrison J. Drummond, John J. Dunham, Francis Kuhn and Charles Nelson; capital stock, $80,000.

MILLEDGEVILLE, GA.—J. G. Croley may be addressed concerning establishment of electric light plant.

MONTEZUMA, GA.—The Montezuma & Oglethorpe Light Company has been incorporated by Jule Felton, V. O. Brown and O. K. Brown to operate electric and other lighting plant, etc.; capital stock, $3,000.

FREDERICKSBURG, VA.—The Mayor may be addressed concerning proposed electric light plant.

RICHMOND, VA.—The Richmond Paper Manufacturing Company has contracted for the installation of an electric light plant.

UNIQUE AND ARTISTIC DESIGNS IN ELECTRIC LAMP SHADES—PORTRAITS OF OUR NAVAL HEROES.

Patriotic Designs in Electric Lamp Shades.

The Phœnix Glass Company, of New York, have recently perfected a series of very beautiful designs for incandescent lamp and gas shades and cylinders. Several of these designs are presented herewith, and, as will be seen, show lifelike etched portraits of three of our naval heroes. The work is very artistic, as was to be expected of the products of the Phœnix Glass Company. As an example of beautiful work, the ELECTRICAL REVIEW presents four of these illustrations, two of which bear a very excellent likeness of Admiral Dewey and the other two likenesses of Admiral Sampson and Admiral Schley.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 1, 1898.

613,286 Emergency fusible cut-out for electric circuits; C. H. Long, Louisville, Ky.—Consists of the opposed wire plates, spanned by the fusible wires, and opposite ones of said plates having sockets or contacts, of the laterally movable switch adapted to engage one of the opposite end plates.

613,309 Electric ignition device for internal-combustion engines; L. W. Ravenez, Paris, France.

613,357 Suspension for electric railway motors; W. Cooper, Cincinnati, Ohio—A motor sleeved to the driven axle in combination with a pair of supports therefor engaging the sides of the motor at points located between the driven axle and the center of gravity of the motor.

613,367 Electric rotary cutter; Fulton Gardner, Chicago, Ill.—A base plate, a combined standard and peripheral guard extending around the rear and top edges of the cutter, an electric motor having an exterior rotating part, a rotary cutter mounted upon the periphery of said exterior rotating part intermediate between the ends thereof and means for supporting said motor from the upper portion of said guard beyond the ends of the exterior rotating part.

613,406 Electric car lighting; William Biddle, New York, N. Y.—Consists of a dynamo having an armature rotated by a connection to the car axle, an external circuit from the commutator containing incandescing lamps in multiple arc, a secondary battery in series in the external or working circuit, a helix of the field magnet in a shunt to the secondary battery and a reverse-wound helix in the main circuit for unifying the action of the dynamo under varying speeds of rotation of the armature.

613,418 Electric railroad; C. L. Kemery, Pittsburgh, Pa.

613,420 Electric vehicle; K. Knudsen, Chicago, Ill.—An electric motor, a hollow shaft upon which the rotating element thereof is mounted, a pair of shafts journaled within said hollow shaft and geared respectively with the opposite wheels of the vehicle, bevel gears mounted on the opposed ends of said shafts, a pair of pinions engaging therewith and mounted on the frame or casing secured to and rotating with said hollow shaft.

613,433 Electric railway system; L. E. Watkins, Springfield, Mass.

613,567 Block-signaling apparatus; T. T. Fogel, Allentown, Pa.—A target, a solenoid and an armature therefor pivotally connected with said target, an electric circuit, a circuit-closer therefor comprising a brush and a disk, a solenoid and an armature therefor, and means carried by said second armature for directly engaging and operating said disk.

613,594 Electrical fuse-wire-holder; W. D. Packard, Warren, Ohio—A visible fuse cut-out comprising an insulator having terminals, a casing projected outwardly from said insulator and having a cap, a fuse wire and a pendent holder therefor located in said casing and projected beyond the inner end thereof, said wire being placed in circuit with said terminals when said casing is forced home in said insulator.

613,612 Electric railway system; L. E. Watkins, Springfield, Mass.

613,647 Insulator for incandescent electric lamps; C. W. Brown, Boston, Mass.

INDUSTRIAL NOTES.

Wm. Mueller and H. J. Schuette, both of Chicago, have formed a company which will be known as the Mueller Electric Company, 713–715 Burling street, Chicago. Wm. Mueller, who has heretofore had the business under the name of Wm. Mueller, assures his old customers that their orders will have prompt attention. They have got out a new catalogue which can be had for the asking.

The American Engine Company, Bound Brook, N. J., have just shipped a complete 25-kilowatt direct-connected plant to the Porvenir sugar estate of Santo Domingo, which will be the first direct-connected plant on the island. They are also about to install a 35-kilowatt complete plant of their own manufacture in the Grenoble Apartment Building, Fifty-seventh street and Seventh ave., N. Y.

One of the greatest problems which presents itself to every electric light station manager is the proper protection of electrical machinery from damage by lightning. Anything leading to a proper solution of the problem is always welcome. The Electric Appliance Company, Chicago, have just issued a special circular on Wurts lightning arresters, which embodies all of the improvements to date in this class of apparatus and gives some valuable hints with reference to protection from lightning.

The Western Electrical Supply Company, St. Louis, Mo., have recently secured the selling agency for apparatus manufactured by the Warren Electric Manufacturing Company, of Sandusky, Ohio, also for the Moloney transformers. In the Warren alternator, they are able to offer to the trade an inductor type machine that combines, with a moderate price, the very salient features of simplicity, durability, high efficiency and close regulation, and it has no revolving wires, brushes or commutator. They furnish them in all sizes. In the Moloney transformers they are able to offer to the trade a transformer they believe to be equal, if not superior, to any on the market, and at the same time offer them at a reasonable price, and back them up with a strong guarantee, making shipment direct from St. Louis. They will furnish a descriptive pamphlet and quote price on application. In connection with the above, they are prepared to make shipment of the Adams–Bagnall alternating enclosed arc lamps, which are up to the usual high standard of the Adams–Bagnall arc lamps for other circuits. They will have ready for distribution in the next few days their alternating-current "bulletin," containing cuts and full description of the above generators, transformers and arc lamps, and will be pleased to mail same on application.

Another New Telephone Manufacturing Company.

The Eureka Electric Company are a recently organized Chicago company with officers and salesrooms at 157–159 South Canal street. The company are entering the telephone field as manufacturers of telephone instruments, switchboard apparatus and electrical specialties, making, however, the telephone interest the essential feature of the business. Mr. I. J. Kusel, who has been known prominently in connection with telephone work, particularly in St Louis and the middle West, is president of the new company; Mr. Arthur Stein, who has been identified with several successful business enterprises in Chicago, is vice-president and general manager, and Mr. H. J. Kusel, brother of the president of the company, secretary and treasurer. The Eureka Electric Company have already issued their first bulletin with illustrations and descriptions of some of the standard forms of apparatus which they are making, and have now in press a comprehensive telephone catalogue which they will send on request.

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Kindred.... ...Interests

The Joseph Dixon Crucible Company, Jersey City, N. J., is out with a calendar blotter for November, carrying a design appropriate to the Thanksgiving season.

"Goulds's Efficient Power Pumps for Every Service," is the title of a catalogue just issued by the Goulds Manufacturing Company, of Seneca Falls, N. Y. It is especially profuse in illustrations, data and valuable tables, and may be had free for the asking.

The Western Electrical Supply Company, 10 and 12 North Ninth street, St. Louis, Mo., have issued a neat duplicate order-book for the convenience of their customers. A rebate is allowed if all the blanks in the book are used for ordering goods from this firm.

In order to obtain as perfect a light as possible in the dry-goods department of their store, Boggs & Buhl, of Allegheny, Pa., have just installed some 200 General Electric enclosed arc lamps of the double-globe type. The whiteness of the light enables purchasers to select their goods with the assurance that the colors will not prove any different when brought to the light of day.

The Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., has issued a handsome and interesting pamphlet, entitled "The Modern Round-house Turntable." The Westinghouse method of applying electricity to the operation of turntables should be especially interesting to railroad managers, inasmuch as it requires no change in the turntable proper, other than attaching the draw-bar lug to the turntable girder.

F. N. Manross, Forestville, Ct., the well known manufacturer of hair springs of all kinds, reports a constant increase in new customers for his non-magnetic springs, having lately filled orders from Japan and England. Mr. Manross manufactures these springs, not only for watches, clocks, etc., but also for electric-indicating and recording gages, and they are considered the acme of perfection by all users. The Manross springs are gaining a wide reputation, as is evidenced by these orders from foreign countries.

The Berlin Iron Bridge Company, of East Berlin, Ct., are erecting for the United Gas Improvement Company, Waterbury, Ct., the steel work for a generator-room and an engine-room. These roofs are to have steel trusses, supporting the roof covering. This covering is corrugated iron lined with the Berlin Iron Bridge Company's patent anti-condensation fireproof lining. The engine-room has a span of about 33 feet, and the span of the generator-room is about 51 feet.

The Edison, Jr., Incandescent Lamp Company, of 27 William street, New York city, are receiving some highly complimentary letters regarding the grade of filaments used in their lamp. The lamp has been put to several severe tests, with the result of proving satisfactory in every experiment. In one instance, a lamp was kept burning continually for an unusual length of time (over 5,000 hours), and, at the end of the period, was found to be in perfect condition, with no appreciable decrease in the power of the light. The following is one of the many letters received by this company:

TUXEDO CLUB,
TUXEDO PARK, NEW YORK.
NEW YORK, October 3, 1898.

THOMAS A. EDISON, JR.,
27 William street, New York.

DEAR SIR—Please pardon my long delay in acknowledging the receipt of your letter, May 26, and the three 16-candle-power, 105-volt, Edison base, Edison, Jr., improved lamps.

Have had the three sample lamps in continuous service since receipt; have shown them on the banquet tables, in octagonal pyramids of ice. "Oh, how beautiful." I can say they have won for you our trade.

In a few days I will have the club order sent for our supply of lamps.

Please write me, do you pack 200 or 250 in barrel lots.

Yours truly,
(Signed) E. I. WILBUR.

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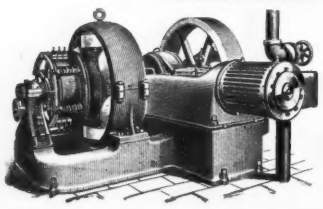
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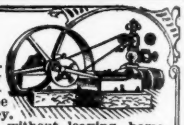
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